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Kodama et al.

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(45) **Date of Patent: *Dec. 1, 2015**

(54) **HOLDER HAVING DETACHABLE LIQUID HOUSING CONTAINER, AND LIQUID HOUSING CONTAINER**

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(73) Assignee: **Seiko Epson Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(65) **Prior Publication Data**

US 2015/0109387 A1 Apr. 23, 2015

Related U.S. Application Data

(62) Division of application No. 13/224,288, filed on Sep. 1, 2011, now Pat. No. 8,950,851.

(30) **Foreign Application Priority Data**

Sep. 3, 2010 (JP) 2010-197327

(51) **Int. Cl.**
B41J 2/175 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/17523*** (2013.01); ***B41J 2/1752*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/17523; B41J 2/1752
USPC 347/85–87, 49
See application file for complete search history.

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Primary Examiner — Henok Legesse
(74) *Attorney, Agent, or Firm* — Kilpatrick Townsend & Stockton LLP

(57) **ABSTRACT**

A liquid housing container in which a liquid to be supplied to a head can be stored may be attached to or detached from a holder, which is provided to a liquid ejecting device having the head for ejecting a liquid. The holder has a rotation point where the mounted liquid housing container may be rotated in a predetermined so as to be detached from the holder.

15 Claims, 17 Drawing Sheets

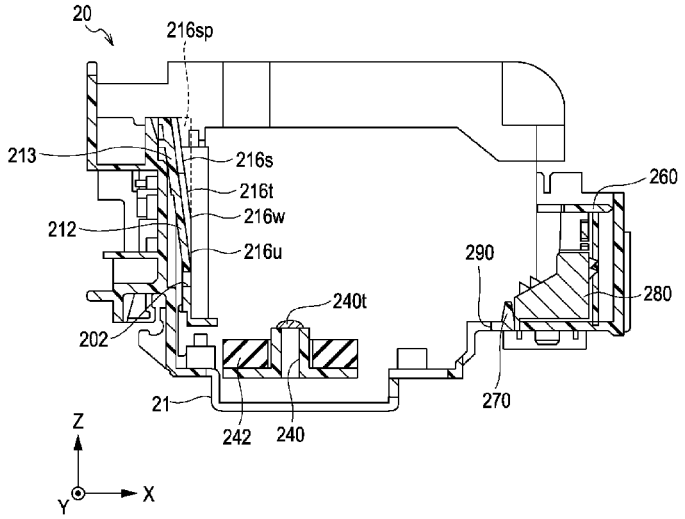

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FIG. 1

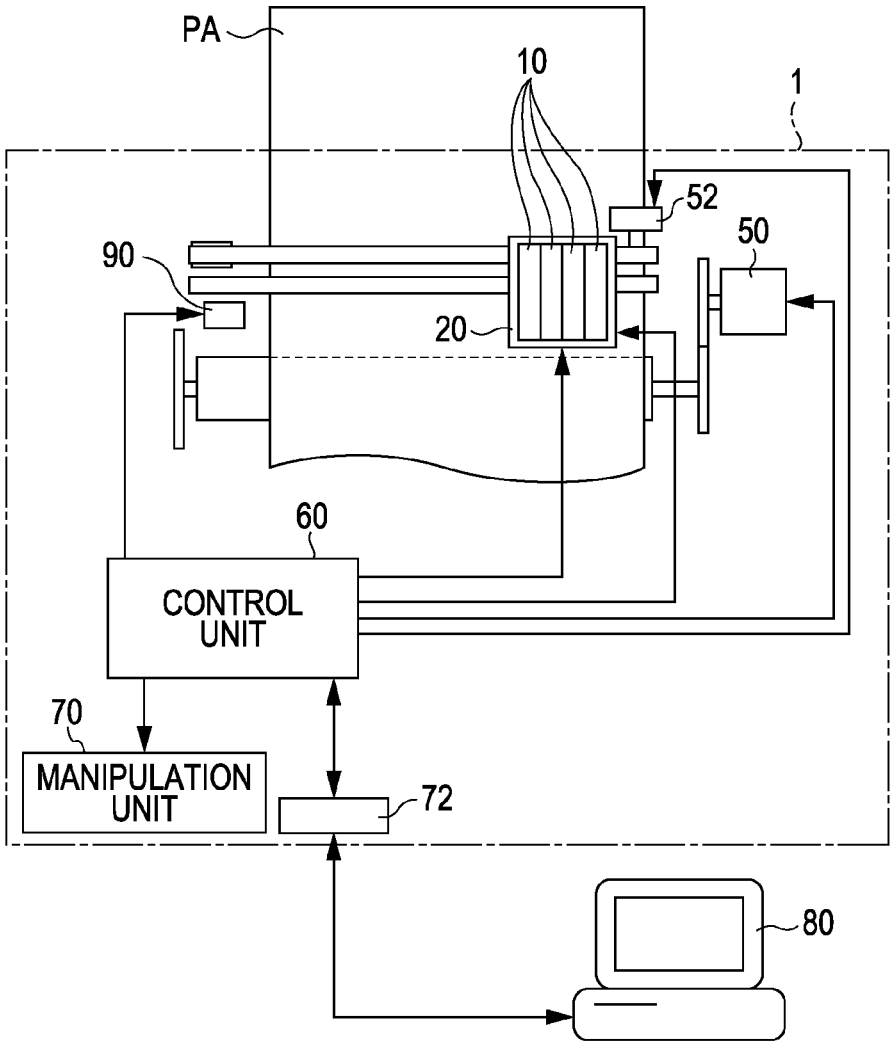


FIG. 2

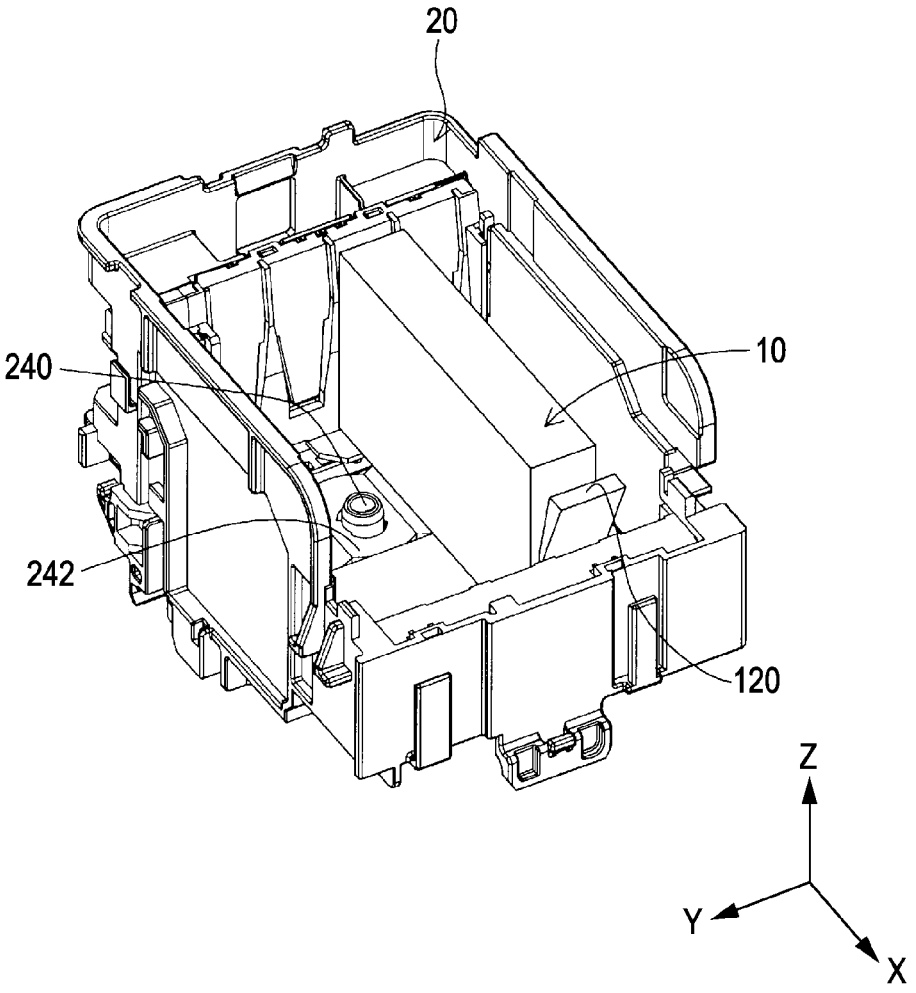


FIG. 3A

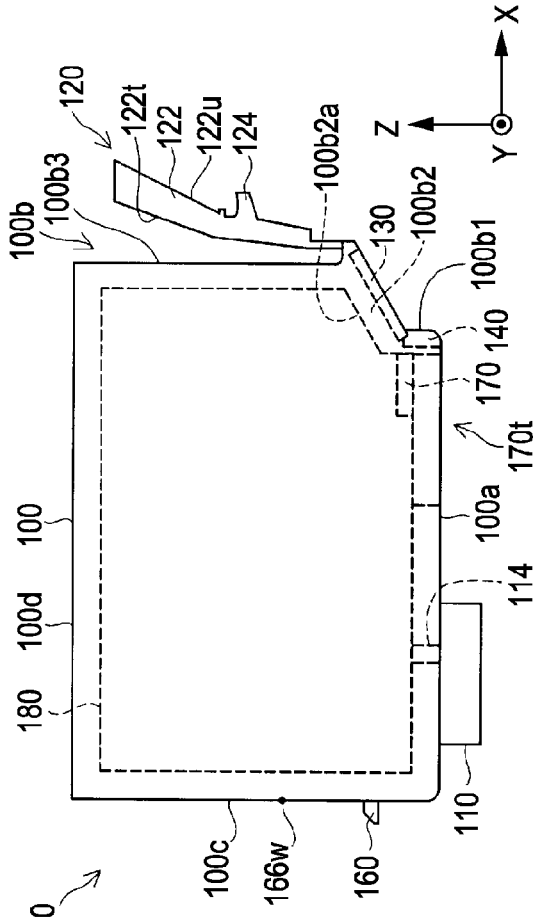


FIG. 3B

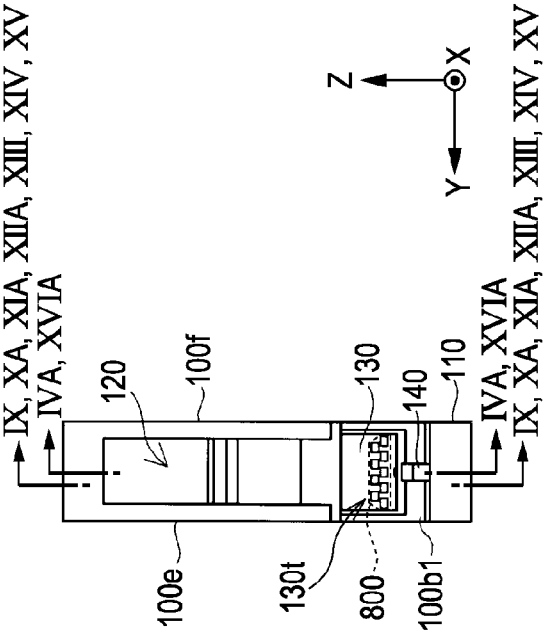


FIG. 3C

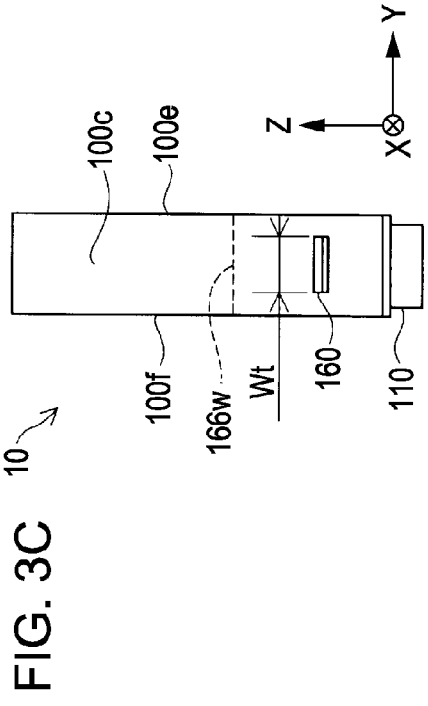


FIG. 3D

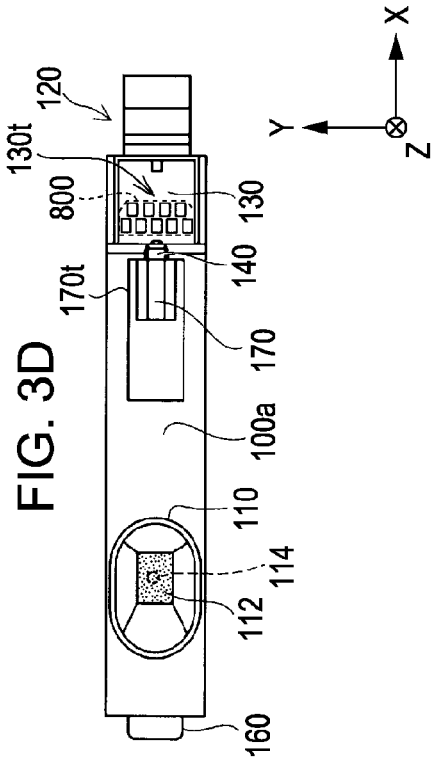


FIG. 4A

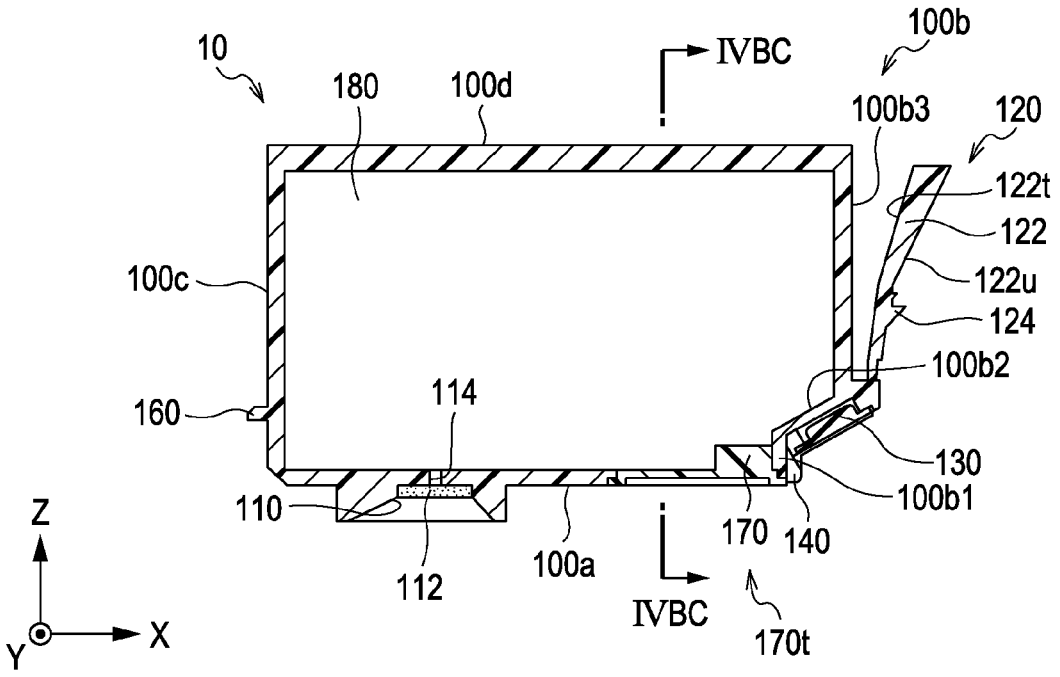


FIG. 4B

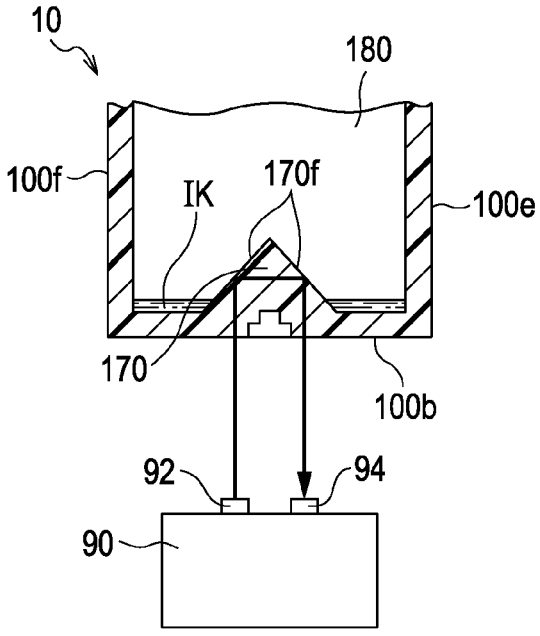


FIG. 4C

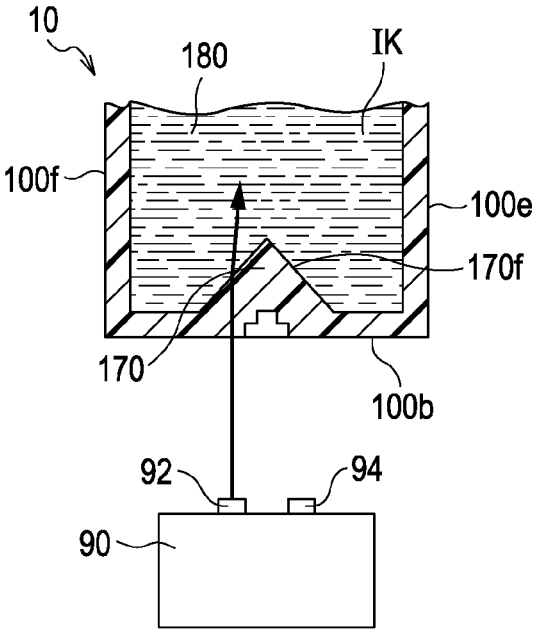


FIG. 5A

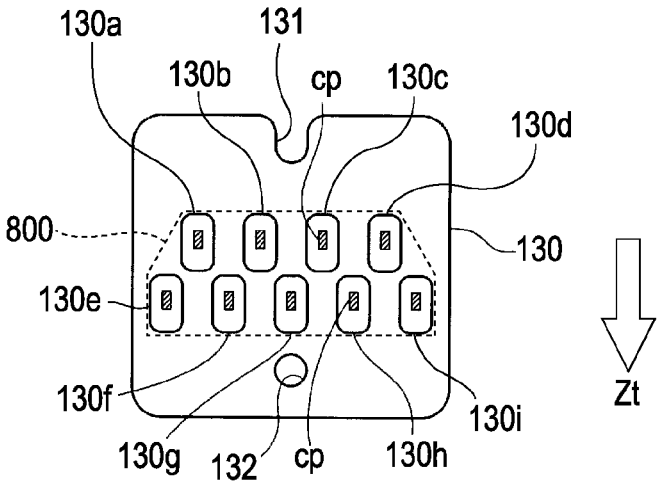

130a
131
130b
cp
130c
130d
800
130
130e
130f
130g
132
cp
130h
130i
Zt

FIG. 5B

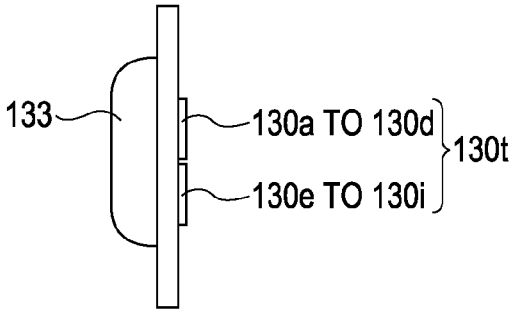

133
130a TO 130d
130e TO 130i
130t

FIG. 6A

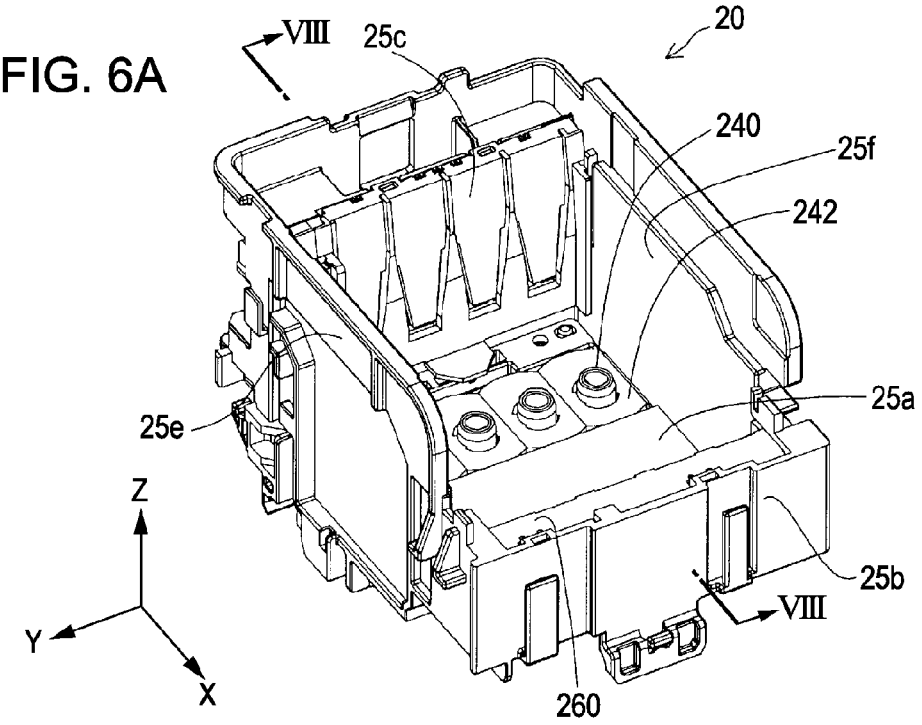

VIII
25c
20
240
25f
242
25a
25e
Z
Y
X
25b
VIII
260

FIG. 6B

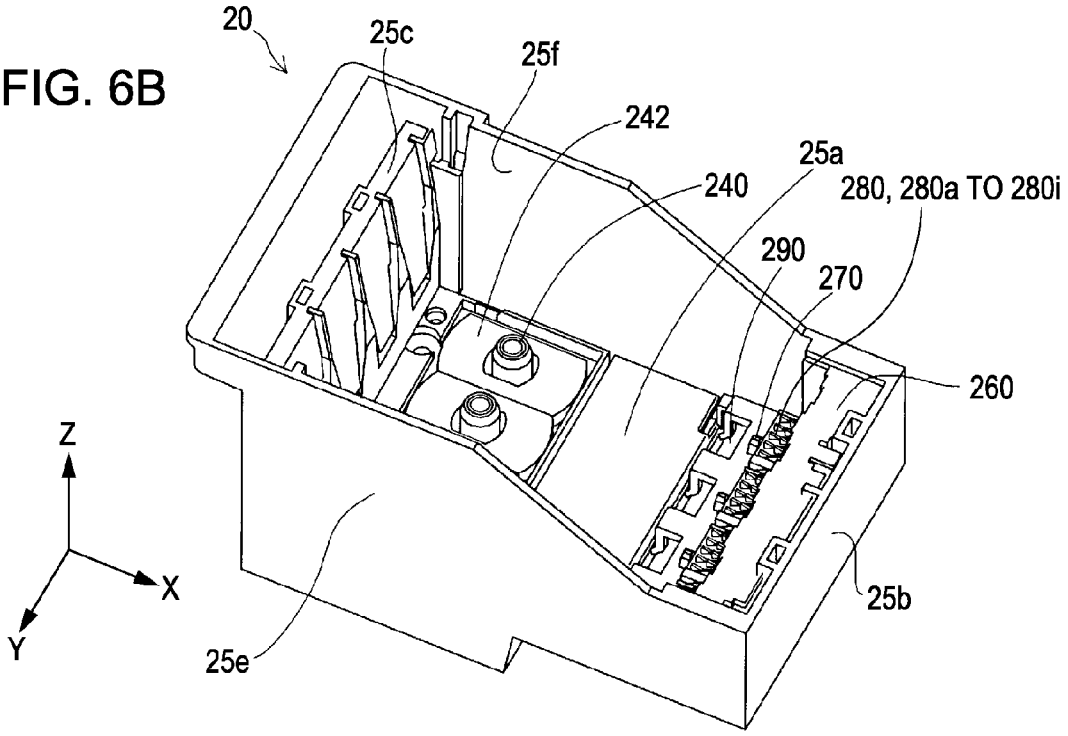

20
25c
25f
242
25a
240
280, 280a TO 280i
290
270
260
Z
X
Y
25b
25e

FIG. 7A

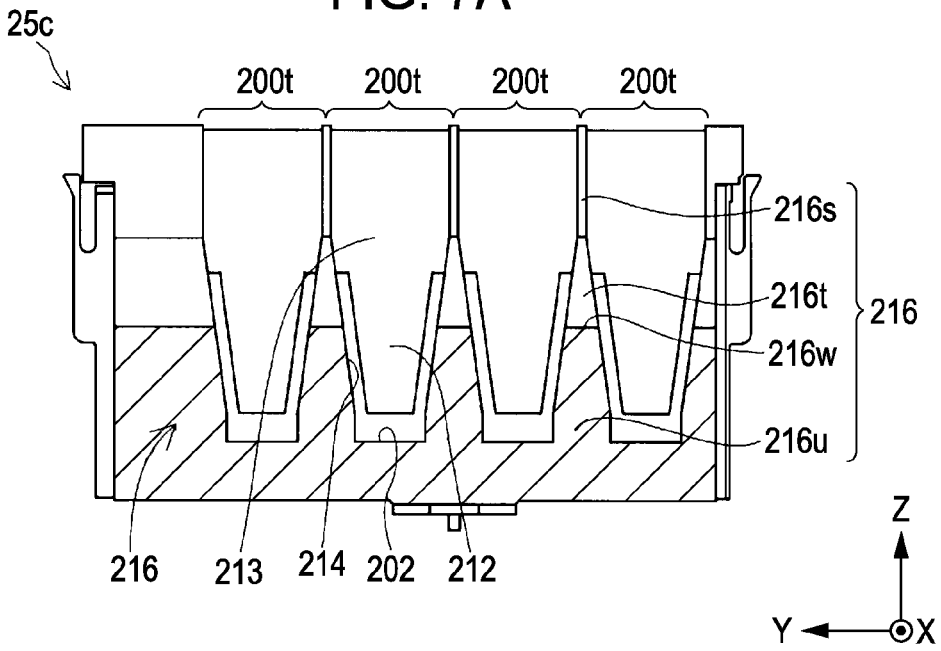

25c
200t
200t
200t
200t
216s
216t
216w
216u
216
216
213
214
202
212
Z
Y
X

FIG. 7B

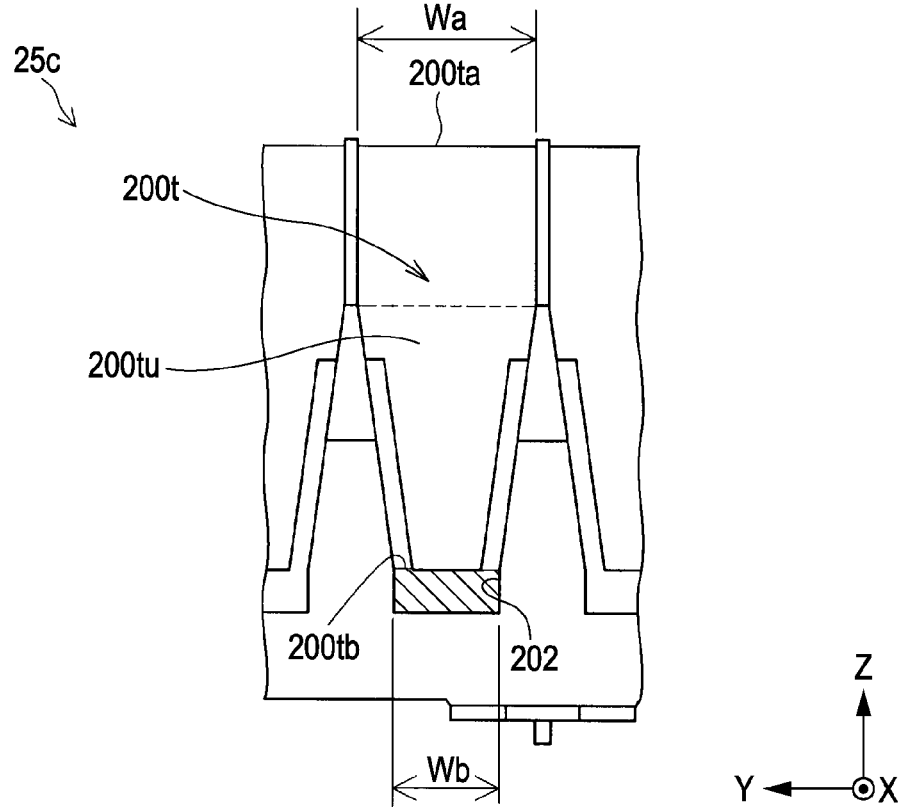

25c
Wa
200ta
200t
200tu
200tb
202
Wb
Z
Y
X

FIG. 8

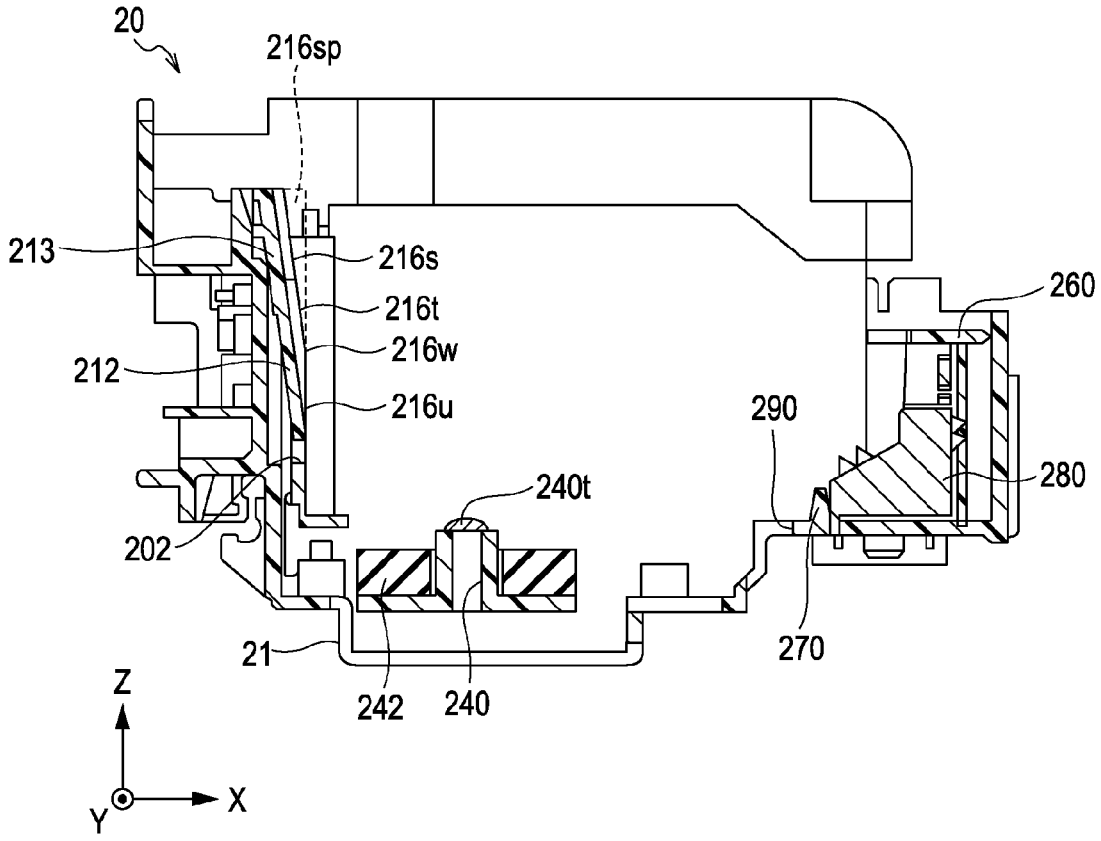

20
216sp
213
216s
216t
216w
212
216u
260
290
280
240t
202
21
242
240
270
Z
Y
X

FIG. 9A

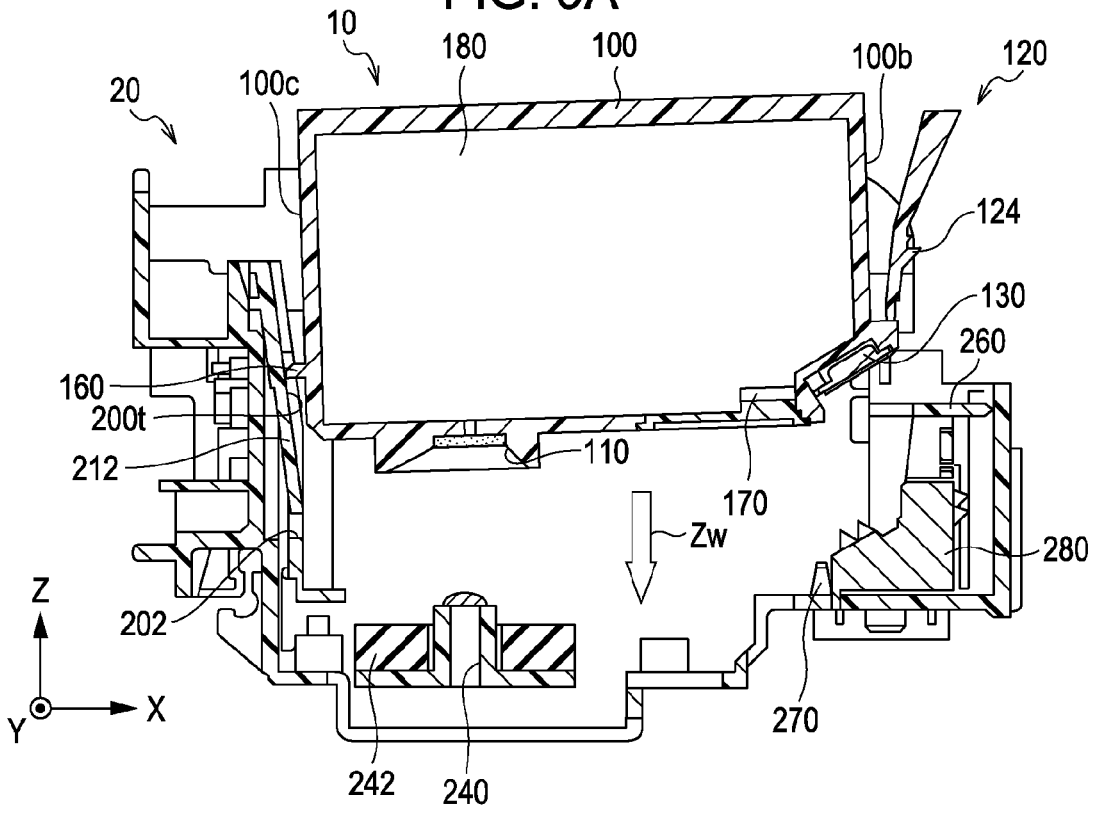

10
180
100
100b
120
20
100c
124
130
260
160
200t
212
110
170
Zw
280
202
270
242
240
Z
X
Y

FIG. 9B

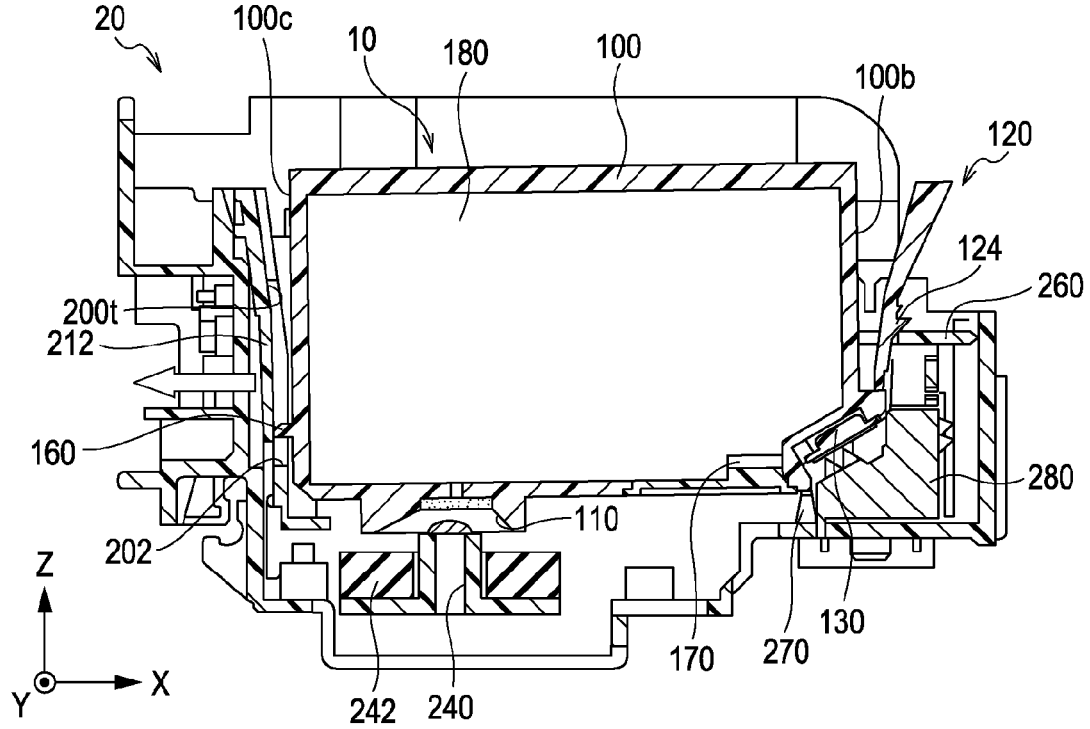

20
100c
10
180
100
100b
120
124
260
200t
212
160
280
110
202
130
170
270
242
240
Z
X
Y

FIG. 10A

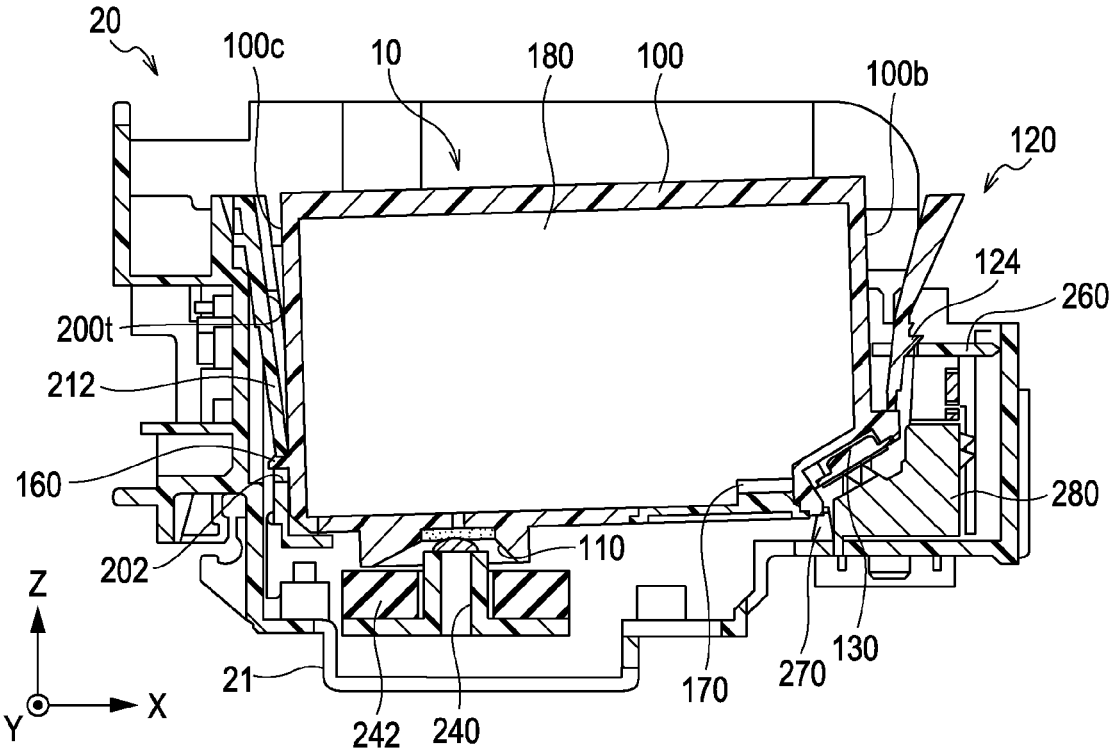


FIG. 10B

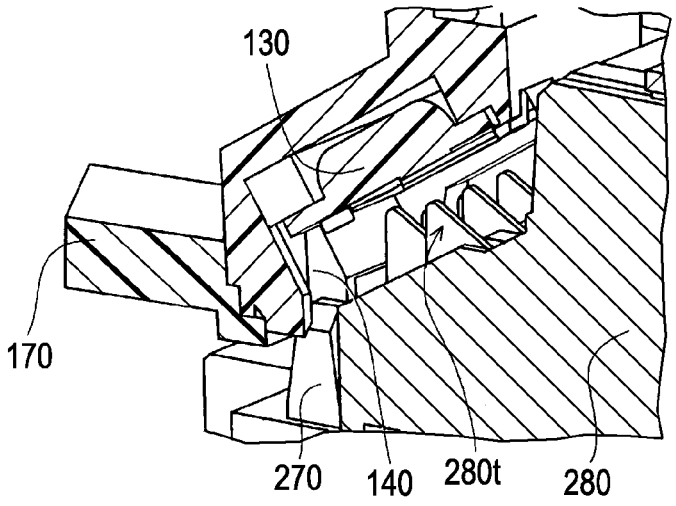


FIG. 11A

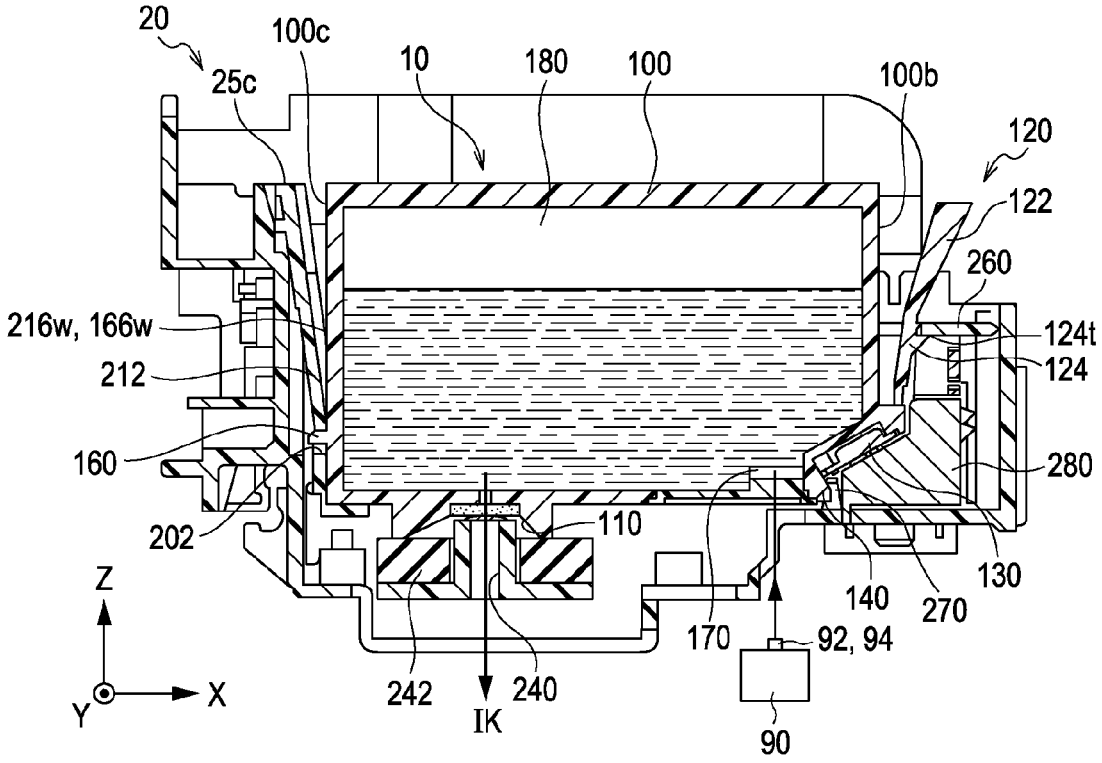


FIG. 11B

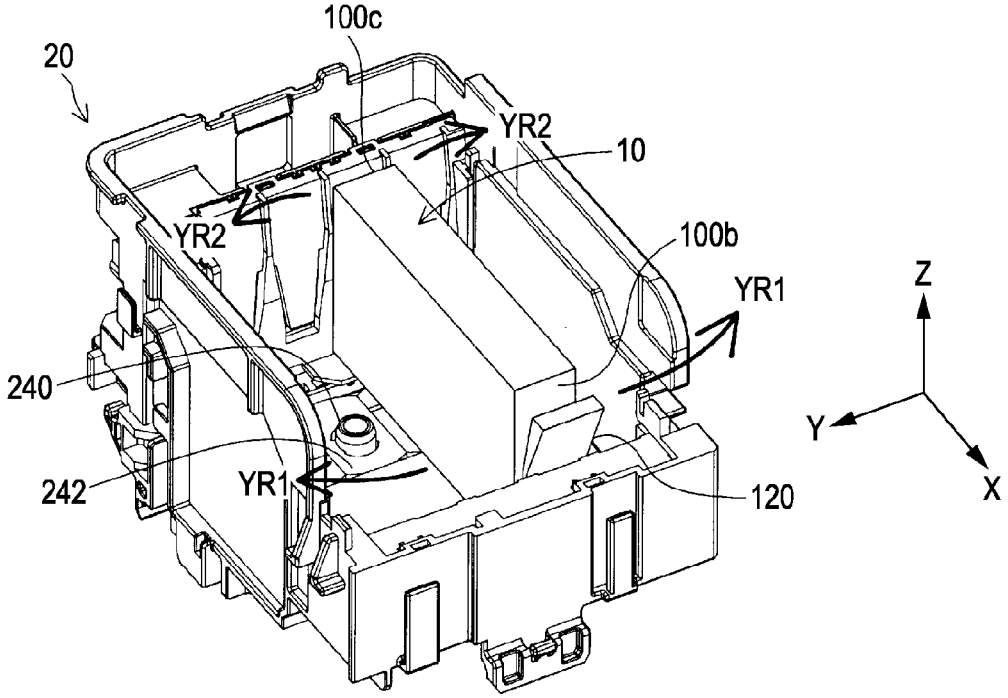


FIG. 12A

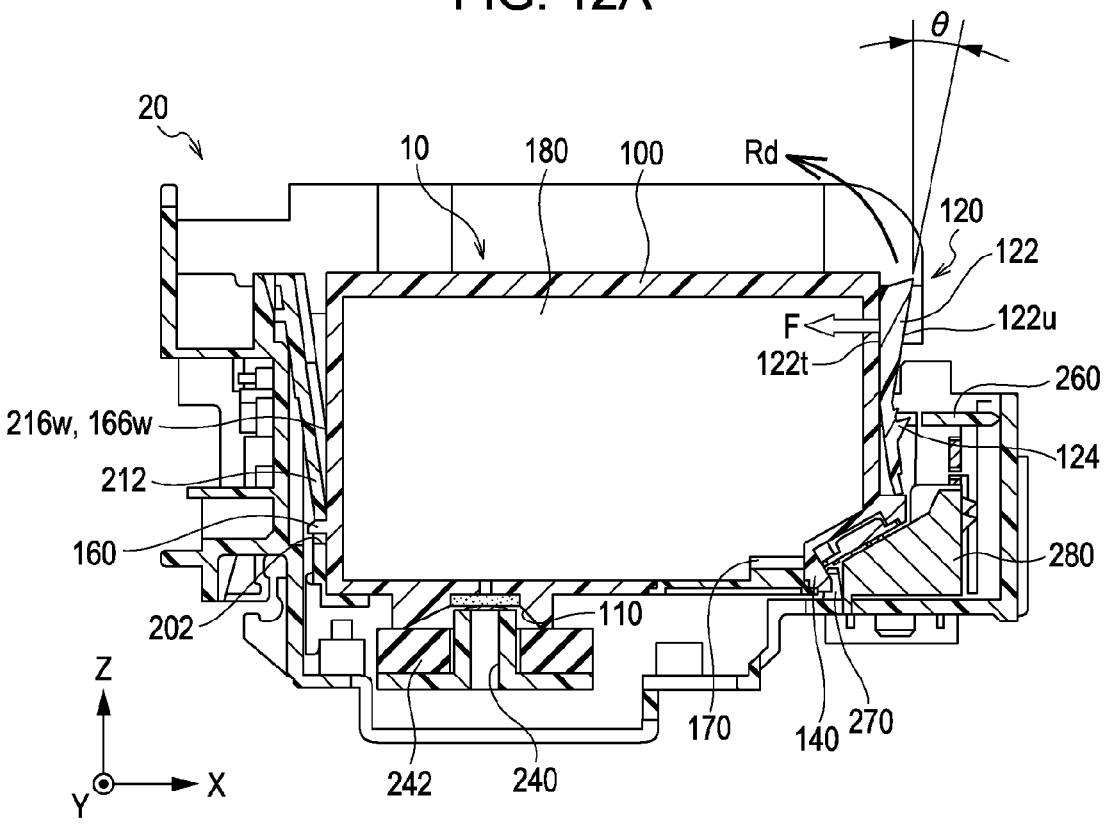


FIG. 12B

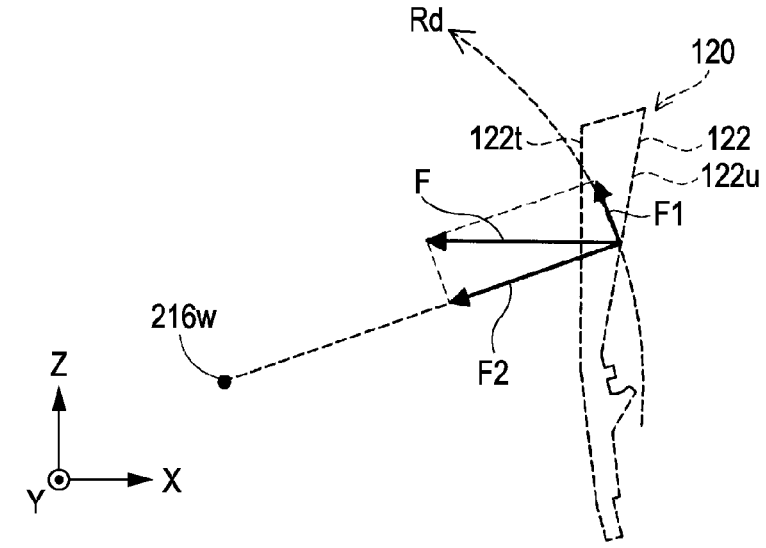


FIG. 13A

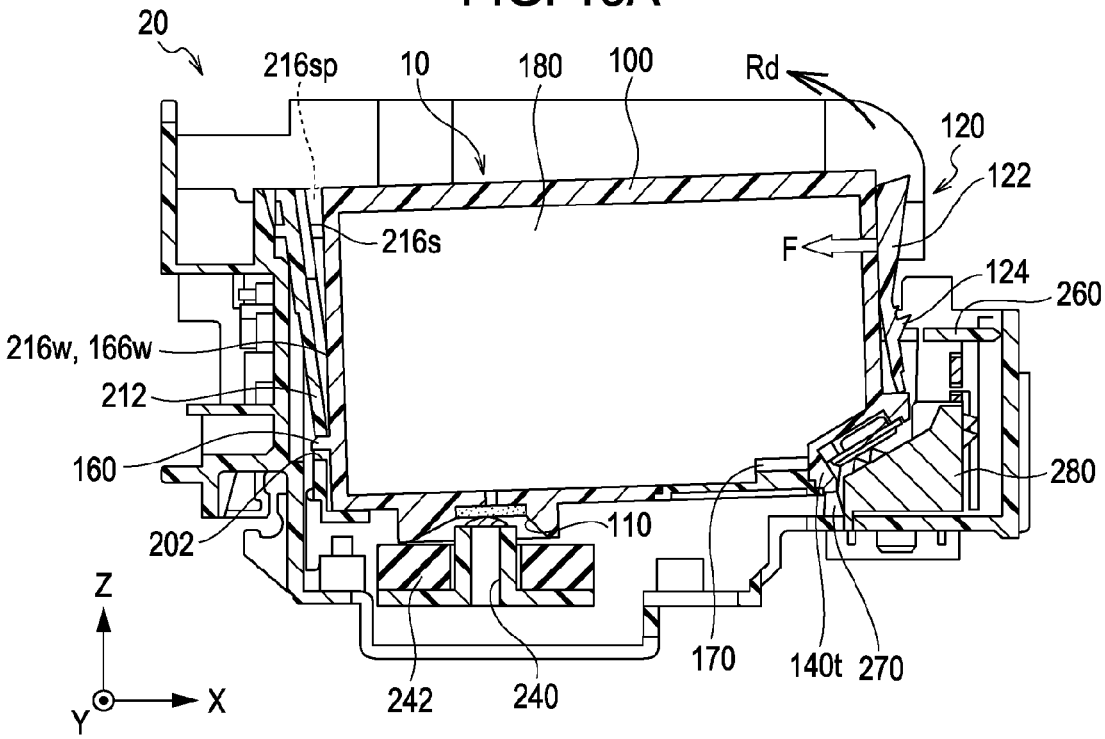


FIG. 13B

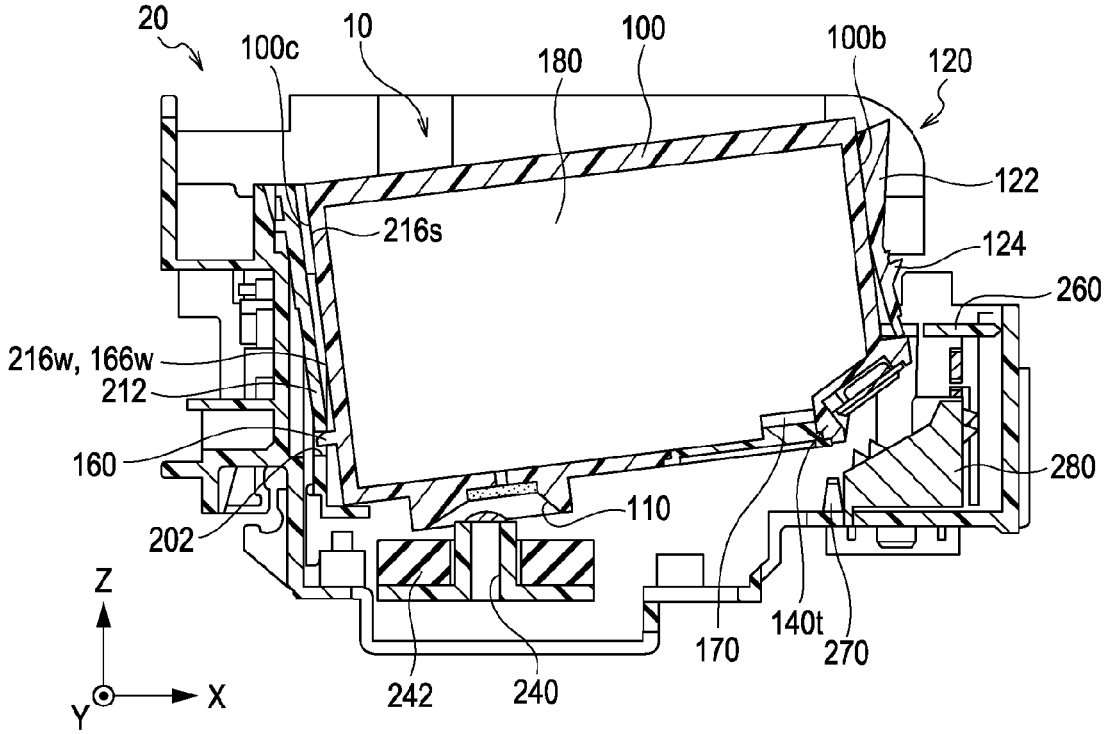


FIG. 14A

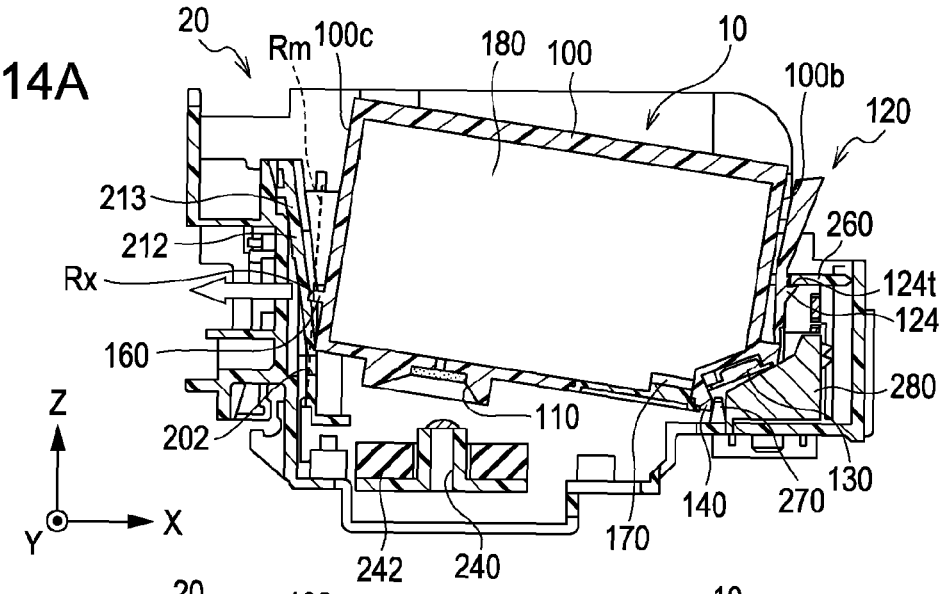


FIG. 14B

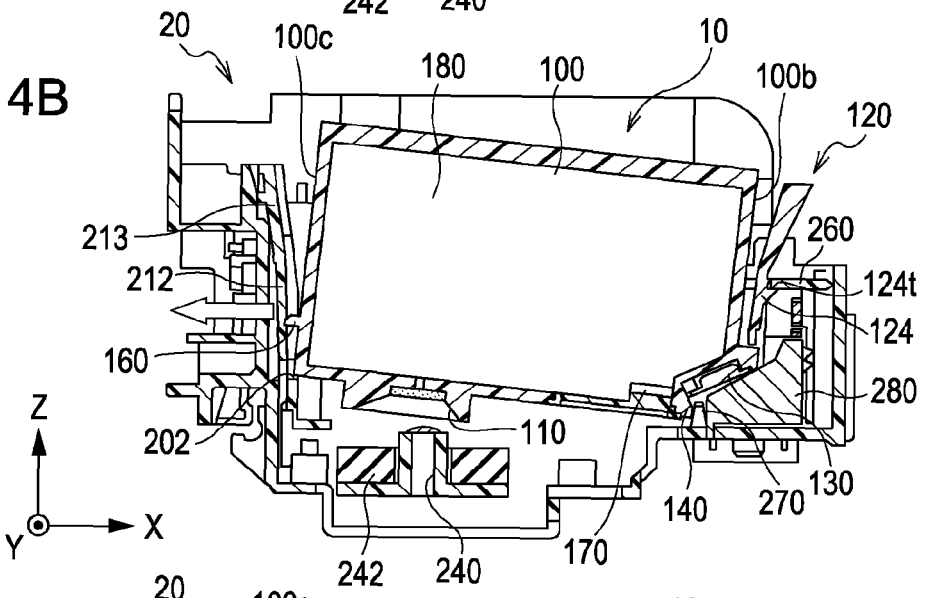


FIG. 14C

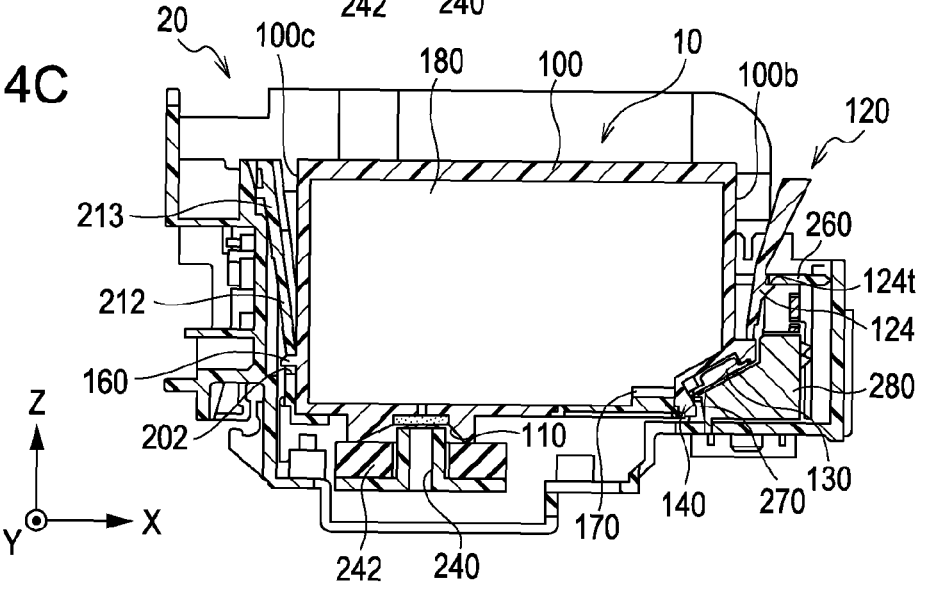


FIG. 15A

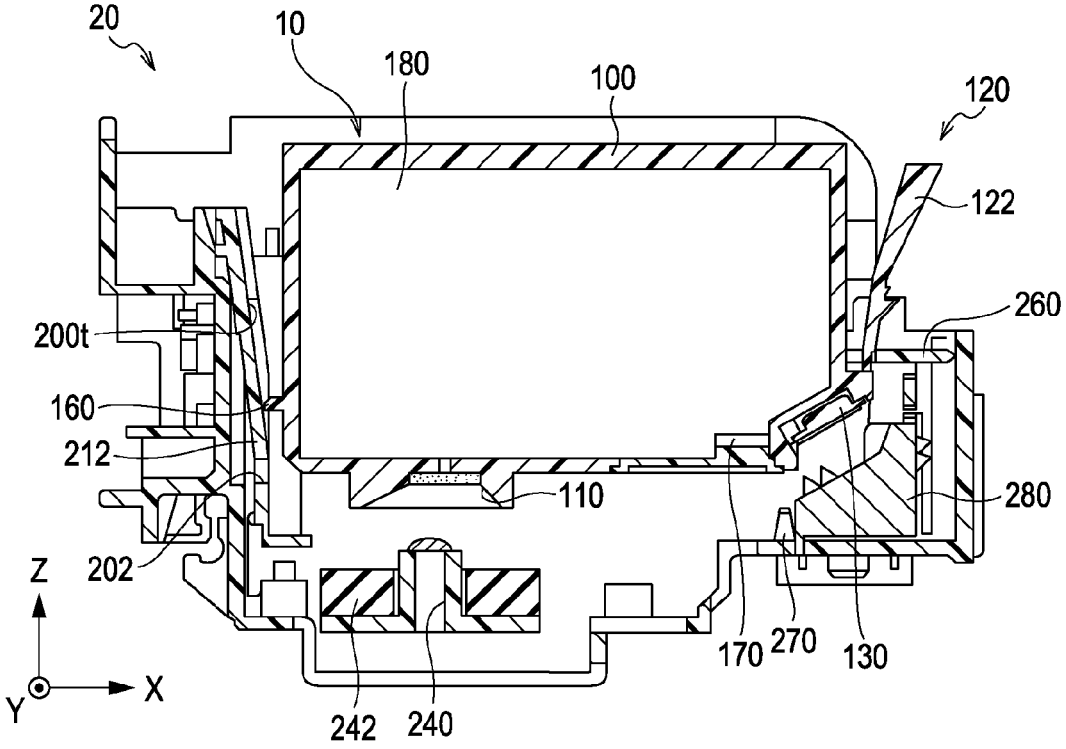


FIG. 15B

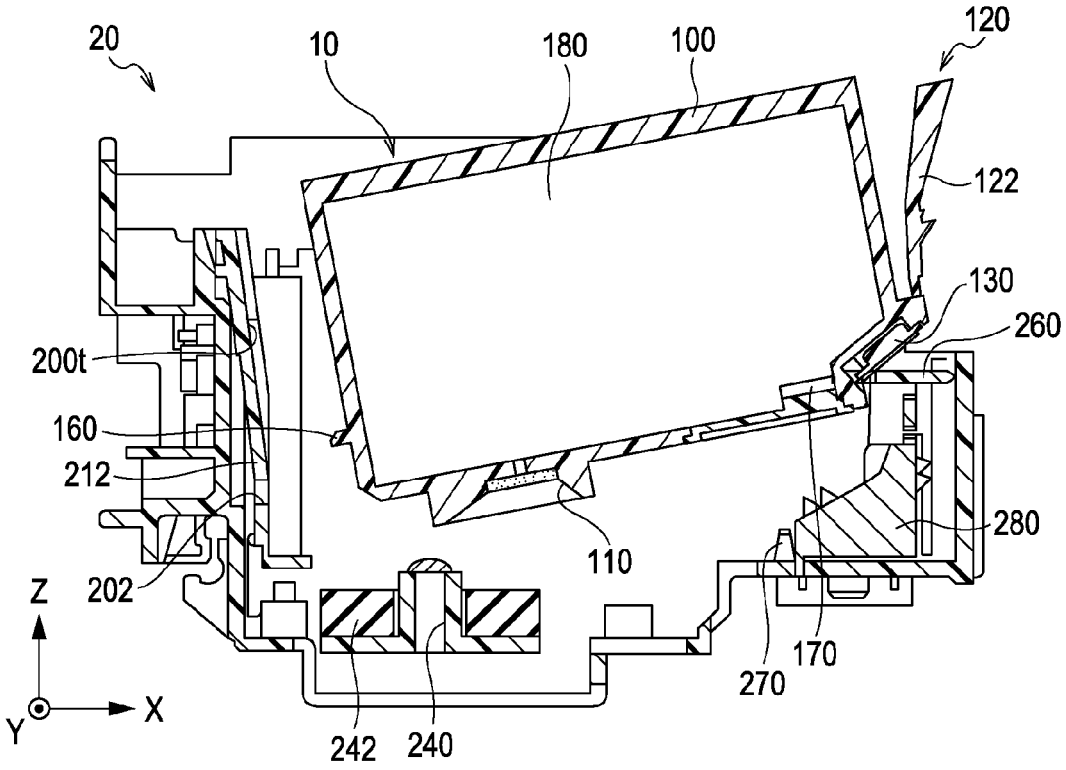


FIG. 16A

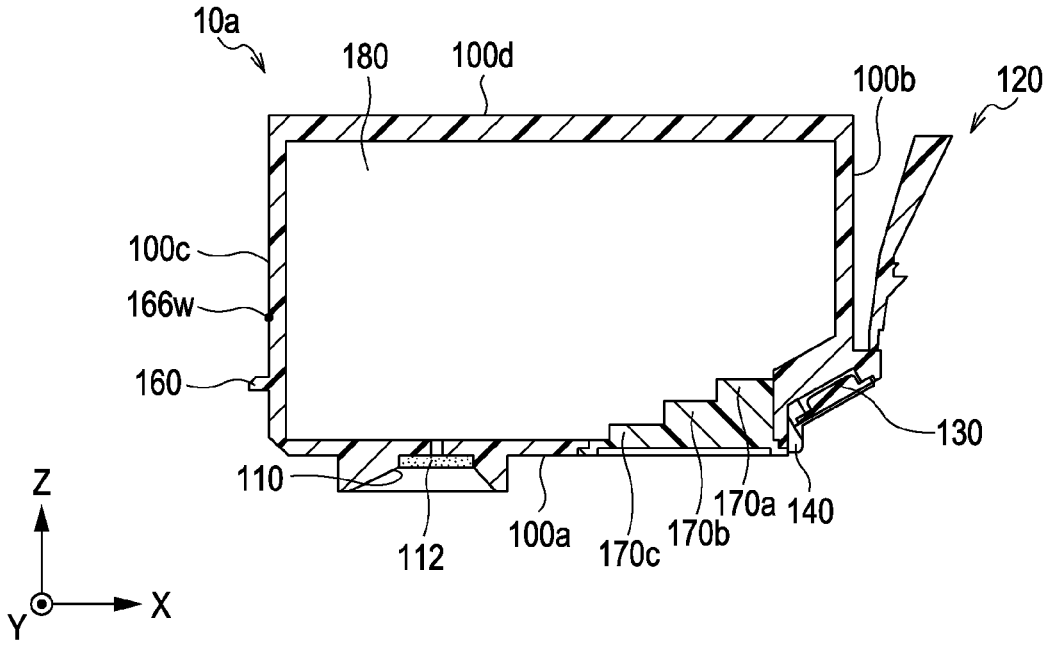


FIG. 16B

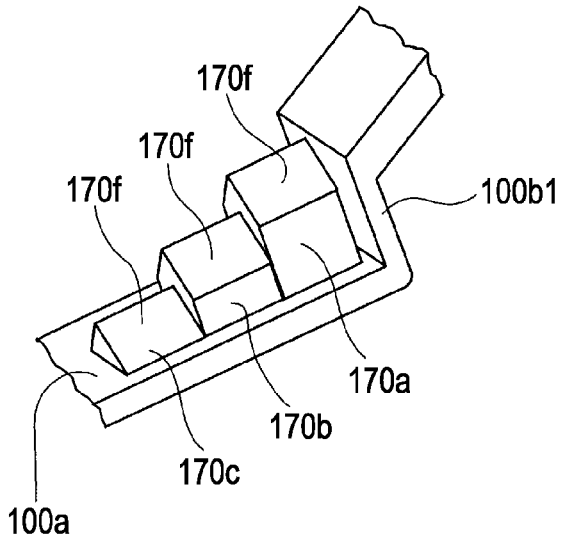


FIG. 17A

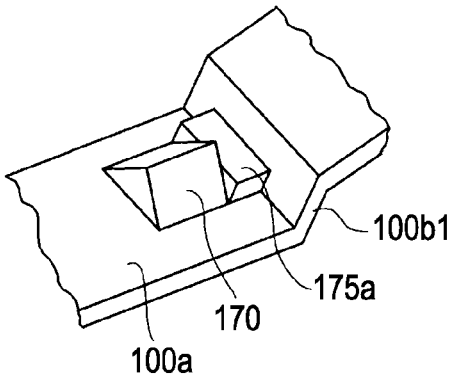


FIG. 17B

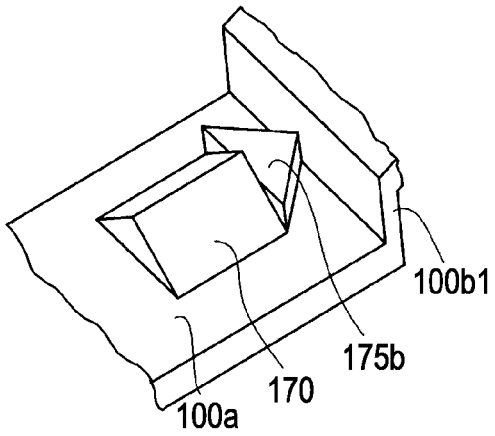


FIG. 17C

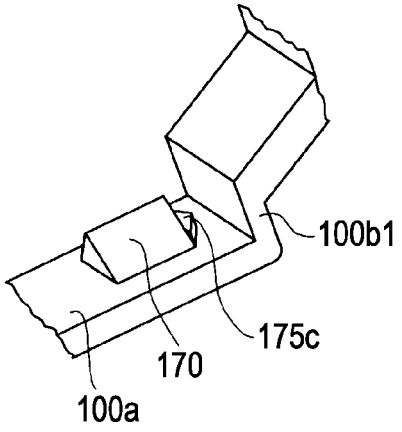


FIG. 17D

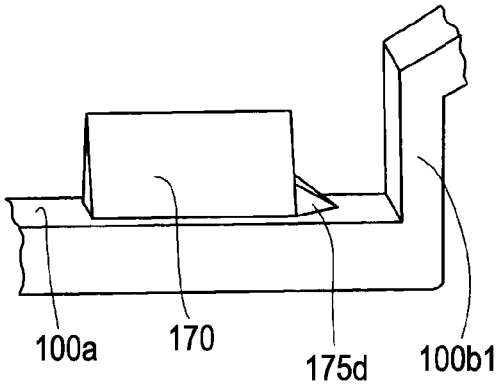
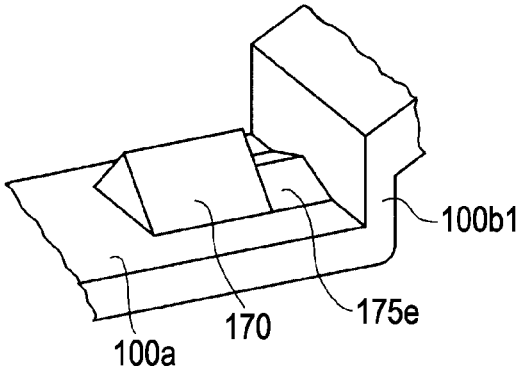


FIG. 17E



HOLDER HAVING DETACHABLE LIQUID HOUSING CONTAINER, AND LIQUID HOUSING CONTAINER

This application is a divisional of U.S. patent application Ser. No. 13/224,288, filed Sep. 1, 2011, which claims the priority to Japanese Patent Application No. 2010-197327, filed Sep. 3, 2010, the entire disclosures of which are incorporated by reference herein.

BACKGROUND

1. Technical Field

The present invention relates to a holder having a detachable liquid housing container, and a liquid housing container.

2. Related Art

A printer which is one example of a liquid ejecting apparatus ejects an ink from a print head to a subject to be printed (for example, printing paper) and performs printing. The technique of using an ink cartridge containing an ink therein is known as an ink supplying technique for the print head (for example, JP-A-2006-142483). In detail, the ink is supplied from the ink cartridge to the print head by mounting the ink cartridge to a holder to which the print head is installed.

The holder may be formed to be detachable from the ink cartridge so that a user may exchange the ink cartridge when the amount of ink is deficient in the ink cartridge.

JP-A-2007-230248 and JP-A-2010-23458 are also examples of the related art.

However, there is still scope for improvement of the manipulation when the ink cartridge is attached to or detached from the holder. For example, a user may find it troublesome when manipulating to detach the ink cartridge from the holder. In particular, in a case where the ink cartridge engages with the holder, it is required to release the engagement so that the ink cartridge is detached from the holder, but a user may find it troublesome in this manipulation.

In addition, when the ink cartridge is attached to the holder, according to the installation order, a part of the ink cartridge may contact the inner wall surface of the holder before the ink cartridge is mounted, which may disturb the insertion of the ink cartridge.

In addition, in order to improve the manipulation, it is possible to divide the holder and provide a wall therebetween. In this case, there may be a problem in that the size of the holder may increase.

The manipulation of attachment/detachment as described above is a common issue of a liquid housing container which is detachably mounted to a liquid ejecting apparatus and a holder to which the liquid housing container may be detachably mounted, without being limited to an ink cartridge and a holder to which the ink cartridge may be detachably mounted.

SUMMARY

An advantage of some aspects of the invention is to provide a holder to which the liquid housing container may be detachably mounted, which has an improved manipulation in attaching or detaching the liquid housing container. In addition, another advantage of some aspects of the invention is to provide a liquid housing container detachably mounted to the holder, which has an improved manipulation for attachment to and detachment from the holder.

The invention is directed to solve at least a part of the above problems and it may be implemented as the following aspects and applications.

Application 1

A holder is provided to a liquid ejecting device having a head for ejecting a liquid and a liquid housing container capable of storing a liquid to be supplied to the head is attachable to or detachable from the holder, wherein the holder has a rotation point for rotating the mounted liquid housing container in a predetermined direction so as to be detached from the holder.

According to the holder of Application 1, since the holder has the rotation point for detaching the liquid housing container, a user may easily detach the liquid housing container from the holder by rotating the liquid housing container.

Application 2

The holder according to Application 1 further includes a device-side bottom wall surface portion which forms a bottom surface; a device-side engagement unit engaged with the liquid housing container to regulate movement of the liquid housing container; and an opposite wall surface portion installed to stand from the device-side bottom wall surface portion and located to face the device-side engagement unit while the device-side bottom wall surface portion is interposed therebetween, wherein the rotation point is formed at the opposite wall surface portion so that the liquid housing container rotates in the predetermined direction centered around the rotation point by adding a force to the liquid housing container in a direction in which the engagement is released.

According to the holder of Application 2, the manipulation for releasing the engagement of the holder and the liquid housing container and the manipulation for detaching the liquid housing container from the holder may be performed in series. By doing so, the manipulation when the liquid housing container is detached from the holder may be improved.

Application 3

In the holder according to Application 2, the liquid housing container attached to or detached from the holder includes a container body having a first wall surface portion which becomes a bottom surface when the liquid housing container is mounted to the holder, a second wall surface portion connected to the first wall surface portion, and a third wall surface portion connected to the first wall surface portion and facing the second wall surface portion, wherein, with respect to a usage posture of the liquid ejecting device, the opposite wall surface portion includes: an opposite surface extending upwards from the device-side bottom wall surface portion, the opposite surface being approximately parallel with an outer surface of the third wall surface portion when the liquid housing container is mounted; and an extension surface which extends from an upper end of the opposite surface in a direction away from the outer surface of the third wall surface portion, wherein the rotation point is defined by a border of the opposite surface and the extension surface.

According to the holder of Application 3, the rotation point may be easily formed using the opposite wall surface portion of the holder.

Application 4

In the holder according to Application 2, the liquid housing container attached to or detached from the holder includes a container body having a first wall surface portion which becomes a bottom surface when the liquid housing container is mounted to the holder, a second wall surface portion connected to the first wall surface portion, and a third wall surface portion connected to the first wall surface portion and facing the second wall surface portion, wherein, with respect to a usage posture of the liquid ejecting device, the opposite wall surface portion includes an opposite surface which extends upward from the device-side bottom wall surface portion and

which is approximately parallel with an outer surface of the third wall surface portion when the liquid housing container is mounted, and wherein a space portion is formed above the opposite surface to receive a part of the liquid housing container so that the liquid housing container is allowed to rotate.

According to the holder of Application 4, the rotation point may be easily formed by means of the space portion and the opposite surface which is one surface of the opposite wall surface portion.

Application 5

In the holder according to any one of Applications 2 to 4, with respect to a usage posture of the liquid ejecting device, the rotation point is located below an engagement point where the liquid housing container is engaged with the device-side engagement unit.

According to the holder of Application 5, by adding an external force in a predetermined direction to a region located above the engagement point of the liquid housing container, the engagement of the holder and the liquid housing container may be released, and the liquid housing container may be rotated and detached from the holder. By doing so, the manipulation when the liquid housing container is detached from the holder may be further improved.

Application 6

In the holder according to any one of Applications 2 to 5, the opposite wall surface portion has a hole portion located closer to the device-side bottom wall surface portion than the rotation point so that a protrusion unit provided to the liquid housing container is inserted thereto to regulate movement of the liquid housing container after being mounted.

According to the holder of Application 6, the movement of the liquid housing container may be regulated by the hole portion after the liquid housing container is mounted, and the protrusion unit of the liquid housing container may be pulled out from the hole portion by rotating the liquid housing container in order to detach the liquid housing container.

Application 7

In the holder according to Application 6, the opposite wall surface portion has a guide channel for guiding the protrusion unit to the hole portion while regulating the movement of the liquid housing container in a width direction by the protrusion unit, when the liquid housing container is mounted.

According to the holder of Application 7, in a case where the liquid housing container is mounted to the holder, a user may easily guide the protrusion unit of the liquid housing container to the hole portion of the holder by inserting the protrusion unit of the liquid housing container into the guide channel. Therefore, the manipulation when the liquid housing container is mounted to the holder may be improved.

Application 8

In the holder according to Application 7, with respect to a usage posture of the liquid ejecting device, the guide channel is formed over the hole portion from an upper end of the opposite wall surface portion.

According to the holder of Application 8, since the upper end of the guide channel is located at the upper end of the opposite wall surface portion, a user may easily insert the protrusion unit of the liquid housing container into the guide channel.

Application 9

In the holder according to Application 7 or 8, with respect to a usage posture of the liquid ejecting device, the width of the upper end of the guide channel is greater than a width of the lower end of the guide channel.

According to the holder of Application 9, since the upper end of the guide channel has a greater width, a user may more easily insert the protrusion unit of the liquid housing container into the guide channel.

Application 10

In the holder according to any one of Applications 7 to 9, the width of the guide channel monotonously decreases as the hole portion gets closer.

According to the holder of Application 10, a user may easily insert the protrusion unit of the liquid housing container into the guide channel and may accurately guide the protrusion unit toward the hole portion.

Application 11

In the holder according to any one of Applications 7 to 10, the guide channel has a lower guide channel having a tapered shape whose width gradually decreases as the hole portion gets closer.

According to the holder of Application 11, a user may smoothly guide the protrusion unit of the liquid housing container to the hole portion by means of the lower guide channel.

Application 12

In the holder according to any one of Applications 7 to 11, with respect to a usage posture of the liquid ejecting device, the lower end of the guide channel has the same width as the width of the hole portion.

According to the holder of Application 12, the protrusion unit of the liquid housing container may be more smoothly guided from the guide channel to the hole portion.

Application 13

In the holder according to any one of Applications 7 to 12, a channel bottom wall surface portion which forms a bottom surface of the guide channel and is opposite to the liquid housing container has a deformation unit which is elastically deformable in the depth direction of the guide channel, and with respect to a usage posture of the liquid ejecting device, the lower end of the deformation unit may reach the hole portion.

According to the holder of Application 13, as the deformation unit is provided, before the liquid housing container is mounted to the holder, the possibility that the movement of the liquid housing container in the holder is restricted may be decreased.

Application 14

In the holder according to Application 13, with respect to a usage posture of the liquid ejecting device, among the region of the channel bottom wall surface portion, the upper end of the deformation unit reaches a location higher than an intersection point where the channel bottom wall surface portion intersects a trajectory along which the protrusion unit rotates centered around an engagement point where the liquid housing container is engaged, before the protrusion unit of the liquid housing container is inserted into the hole portion, in a case where a container-side regulating unit of the liquid housing container which is to be engaged with the device-side engagement unit is engaged with the device-side engagement unit.

According to the holder of Application 14, before the protrusion unit is inserted into the hole portion, even when the container-side regulating unit of the liquid housing container is engaged with the device-side engagement unit, the possibility that the movement of the liquid housing container is restricted in the holder may be decreased.

Application 15

In the holder according to Application 13 or 14, the deformation unit is obtained by forming notches at both ends of the channel bottom wall surface portion.

According to the holder of Application 15, the deformation unit may be formed with a simple configuration by forming notches at both ends of the channel bottom wall surface portion.

Application 16

In the holder according to any one of Application 2 to 15, the device-side bottom wall surface portion includes a first device-side regulating unit which regulates the movement of the liquid housing container at least in a width direction by cooperating with a first regulating unit of the liquid housing container.

According to the holder of Application 16, the movement of the liquid housing container after being mounted may be suppressed.

Application 17

In the holder according to Application 16, the first device-side regulating unit has a protrusive shape into which the first regulating unit which is a notch is inserted.

According to the holder of Application 17, since the notch for regulating the movement in the width direction is installed to the liquid housing container which moves with respect to the holder when being mounted, the possibility that the mounting operation of the liquid housing container is restricted may be decreased rather than the case where the protrusion unit is installed instead of the notch.

Application 18

A liquid ejecting device has the holder according to any one of Applications 1 to 17.

According to the liquid ejecting device of Application 18, it is possible to provide a liquid ejecting device equipped with the holder with an improved manipulation when the liquid housing container is attached or detached.

Application 19

A liquid housing container is attachable to and detachable from a liquid ejecting device having a head for ejecting a liquid, the liquid housing container including: a container body which forms a liquid receiving chamber for receiving a liquid therein and includes a first wall surface portion which becomes a bottom surface when the liquid ejecting device is mounted to a holder, a second wall surface portion connected to the first wall surface portion, and a third wall surface portion connected to the first wall surface portion to face the second wall surface portion; and an elastic portion having one end mounted to the second wall surface portion and having elasticity, the elastic portion being used for attachment to or detachment from the holder, wherein the elastic portion includes: a container-side regulating unit engaged with the holder to regulate the movement of the liquid housing container; and an engagement releasing unit provided above the container-side regulating unit and elastically deformed by an external force added thereto in a direction of pressing against the second wall surface portion to release the engagement, the engagement releasing unit allowing the liquid housing container to be detached from the holder by rotating the liquid housing container centered around a rotation point which is a contact portion of the third wall surface portion and the holder located below the engagement point.

According to the liquid housing container of the Application 19, the liquid housing container may be rotated to release the engagement of the liquid housing container by the engagement releasing unit and to detach the liquid housing container from the holder.

Application 20

In the liquid housing container according to Application 19, the engagement releasing unit includes a first side surface opposite to the second wall surface portion and a second side surface opposite to the first side surface, and, in a case where the first side surface contacts the second wall surface portion, the second side surface is formed to be closer to the rotation point from the upper end to the lower end with respect to the direction in which the second and third wall surface portions are opposite.

According to the liquid housing container of Application 20, the second side surface is formed to be closer to the rotation point from the upper end to the lower end. Therefore, by applying an external force to the engagement releasing unit in the direction approaching the second wall surface portion (the length direction of the liquid housing container), the force in the rotation direction for rotating and detaching the liquid housing container may be efficiently transferred to the engagement releasing unit. By doing so, the liquid housing container may be rotated by the operation for releasing the engagement so that the liquid housing container may be easily detached from the holder.

Further, the invention may be implemented in various ways, and in addition to the liquid ejecting device equipped with the holder and the liquid housing container, the invention may be implemented as a method for manufacturing the holder having the above distinctive configuration and a method for manufacturing the liquid housing container having the above distinctive configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

FIG. **1** is a schematic diagram showing a liquid ejecting apparatus.

FIG. **2** is a perspective view showing an appearance of a holder to which a cartridge is mounted.

FIGS. **3**A to **3**D are first diagrams for illustrating the cartridge.

FIGS. **4**A to **4**C are second diagrams for illustrating the cartridge.

FIGS. **5**A and **5**B are diagrams for illustrating a circuit board.

FIGS. **6**A and **6**B are diagrams for illustrating a holder.

FIGS. **7**A and **7**B are diagrams for illustrating a detailed configuration of an opposite wall surface portion.

FIG. **8** is a sectional view taken along the line VIII-VIII of FIG. **6**A.

FIGS. **9**A and **9**B are diagrams for illustrating a mounted state of the cartridge.

FIGS. **10**A and **10**B are second diagrams for illustrating a mounted state of the cartridge.

FIGS. **11**A and **11**B are diagrams for illustrating the state after the mounting.

FIGS. **12**A and **12**B are diagrams for illustrating a detached state of the cartridge.

FIGS. **13**A and **13**B are second diagrams for illustrating a detached state of the cartridge.

FIGS. **14**A to **14**C are diagrams for illustrating a mounting manner in a separate method.

FIGS. **15**A and **15**B are diagrams for illustrating a mounting manner in a separate method.

FIGS. **16**A and **16**B are diagrams for illustrating a cartridge of a second embodiment.

FIGS. **17**A to **17**E are diagrams for illustrating modified shapes of the first modified example.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Next, embodiments of the invention will be described in the following order.

A. First Embodiment

B. Second Embodiment

C. Modified Example

A. First Embodiment

A-1. Configuration of Liquid Ejecting Apparatus

FIG. **1** is a schematic diagram showing a liquid ejecting apparatus **1** having a liquid housing container **10** and a holder **20** as a first embodiment of the invention. The liquid ejecting apparatus **1** is an ink jetprinter **1** (hereinafter, referred to as just a "printer **1**") which ejects an ink to a printing paper PA to perform printing. The printer **1** includes an ink cartridge **10** serving as a liquid housing container, a holder **20**, a first motor **52**, a second motor **50**, a control unit **60**, a manipulation unit **70**, a predetermined interface **72**, and an optical detection device **90**. In addition, hereinafter, the ink cartridge **10** is simply called a "cartridge **10**".

The holder **20** has a print head (not shown) for ejecting an ink to the printing paper PA and its opposite side. In addition, the cartridge **10** is detachably loaded to the holder **20**. In each cartridge **10**, an ink of cyan, magenta, yellow or the like is received, respectively. The ink received in the cartridge **10** is supplied to the print head of the holder **20** so that the ink is ejected to the printing paper PA.

The first motor **52** drives the holder **20** in a main scanning direction. The second motor **50** feeds the printing paper PA in a sub-scanning direction. The control unit **60** controls overall operations of the printer **1**.

The optical detection device **90** is fixed at a predetermined location. When the holder **20** is moved to a predetermined location, the optical detection device **90** irradiates light toward the cartridge **10** in order to detect the remaining amount of the ink. In addition, the details will be described later.

The control unit **60** controls the first motor **52**, the second motor **50** and the print head based on printing data received from a computer **80** or the like connected thereto via the predetermined interface **72** to perform printing. The control unit **60** is connected to the manipulation unit **70** to receive various manipulations from a user.

FIG. **2** is a perspective view showing an appearance of the holder **20** to which the cartridge **10** is mounted. For ease of description, FIG. **2** shows that one cartridge **10** is mounted to the holder **20**. In addition, in order to specify directions, X, Y and Z axes orthogonal to each other are depicted in FIG. **2**. The X, Y and Z axes orthogonal to each other are also given to following figures as necessary.

The holder **20** is configured so that four cartridges **10** may be mounted. In addition, the number of cartridges **10** which can be mounted to the holder **20** is not limited to four, and the configuration of the holder **20** may be changed according to the number of required cartridges **10**. Regarding the posture of the printer **1** in use, the Z-axis direction becomes a vertical direction, and the negative Z-axis negative direction becomes a vertical downward direction. In addition, the main scanning direction of the printer **1** becomes a Y-axis direction.

The holder **20** has a liquid supply tube **240**. The liquid supply tube **240** communicates the print head of the holder **20** with the cartridge **10**. The ink in the cartridge **10** is communicated with the print head via the liquid supply tube **240**. In addition, an elastic member **242** is installed around the liquid supply tube **240** so that the ink does not leak out. The cartridge **10** has a lever **120** which is an elastic portion that is elastically deformed. A user may detach the cartridge **10** from the holder **20** by manipulating the elastic portion **120**. In addition, the attaching/detaching manipulation of the cartridge **10** to/from the holder **20** will be described in detail later.

A-2. Configuration of Cartridge

Next, the configuration of the cartridge **10** will be described with reference to FIGS. **3**A to **4**C. FIGS. **3**A to **3**D are drawings for illustrating the cartridge **10**. FIG. **3**A is a side view of the cartridge **10**. FIG. **3**B is a front view of the cartridge **10**. FIG. **3**C is a rear view of the cartridge **10**. FIG. **3**D is a bottom view of the cartridge **10**. FIGS. **4**A to **4**C are second drawings for illustrating the cartridge **10**. FIG. **4**A is a sectional view taken along the line IVA-IVA of FIG. **3**B. FIGS. **4**B and **4**C are drawings for illustrating a method for detecting a remaining amount of ink. In FIGS. **4**B and **4**C, the sectional view of the cartridge **10** taken along the line IVBC-IVBC of FIG. **4**A is shown.

As shown in FIGS. **3**A, **3**B and **3**D, the cartridge **10** includes a container body **100**, a lever **120**, a liquid supply hole **110**, a circuit board **130**, and a prism unit **170***t*. The container body **100**, the lever **120** and the liquid supply hole **110** are formed with a synthetic resin such as polypropylene or the like.

As shown in FIGS. **3**A to **3**D, the container body **100** has a first wall surface portion (also called a "bottom surface portion") **100***a*, a second wall surface portion (also called a "front surface portion") **100***b*, a third wall surface portion (also called a "rear surface portion") **100***c*, a fourth wall surface portion (also called an "upper surface portion") **100***d*, a fifth wall surface portion (also called a "left side surface portion") **100***e*, and a sixth wall surface portion (also called a "right side surface portion") **100***f*. The container body **100** has a liquid receiving chamber **180** formed by the first to sixth wall surface portions **100***a* to **100***f* to receive an ink therein (FIG. **3**A).

The first wall surface portion **100***a* is a wall surface portion at the Z-axis negative direction with respect to the liquid receiving chamber **180**. The second wall surface portion **100***b* is a wall surface portion at the X-axis positive direction with respect to the liquid receiving chamber **180**. The third wall surface portion **100***c* is a wall surface portion at the X-axis negative direction with respect to the liquid receiving chamber **180**. The fourth wall surface portion **100***d* is a wall surface portion at the Z-axis positive direction with respect to the liquid receiving chamber **180**. The fifth wall surface portion **100***e* is a wall surface portion at the Y-axis positive direction with respect to the liquid receiving chamber **180**. The sixth wall surface portion **100***f* is a wall surface portion at the Y-axis negative direction with respect to the liquid receiving chamber **180**. In addition, with respect to the cartridge **10**, the direction (Z-axis direction) in which the first wall surface portion **100***a* is opposite to the fourth wall surface portion **100***d* is set to be the height direction. In addition, the direction (X-axis direction) in which the second wall surface portion **100***b* is opposite to the third wall surface portion **100***c* is set to be the length direction. In addition, the direction (Y-axis direction) in which the fifth wall surface portion **100***e* is opposite to the sixth wall surface portion **100***f* is set to be the width direction.

The first wall surface portion **100***a* configures an approximately rectangular bottom surface at both inner and outer surfaces with respect to a mounting posture to the holder **20**. The fourth wall surface portion **100***d* is a wall surface portion

opposite to the first wall surface portion **100***a* and configures an approximately rectangular top surface at both inner and outer surfaces with respect to the mounting posture. The outer surfaces of the first and fourth wall surface portions **100***a* and **100***d* become parallel surfaces with respect to the mounting posture.

As shown in FIGS. **3**A to **3**D, the second, third, fifth and sixth wall surface portions **100***b*, **100***c*, **100***e* and **100***f* are respectively connected to sides (four sides) of the first and fourth wall surface portions **100***a* and **100***d*. In other words, the second, third, fifth and sixth wall surface portions **100***b*, **100***c*, **100***e* and **100***f* are installed to stand from the first wall surface portion **100***a*. Among them, the third, fifth and sixth wall surface portions **100***c*, **100***e* and **100***f* perpendicularly intersect the first and fourth wall surface portions **100***a* and **100***d*. Namely, the outer surface of each wall surface portion **100***c*, **100***e* and **100***f* is perpendicular to the horizontal surface with respect to the mounting posture. The second wall surface portion **100***b* is opposite to the third wall surface portion **100***c*. In addition, the fifth wall surface portion **100***e* is opposite to the sixth wall surface portion **100***f*.

As shown in FIG. **3**A, the second wall surface portion **100***b* has a first vertical wall portion **100***b***1**, a slanted wall portion **100***b***2** and a second vertical wall portion **100***b***3**. With respect the mounting posture, the first vertical wall portion **100***b***1** is located at the lowermost region of the second wall surface portion **100***b* in a right vertical direction and stands in a right upward direction from the first wall surface portion **100***a*. The second vertical wall portion **100***b***3** is located at the uppermost region of the second wall surface portion **100***b* and is perpendicular to the fourth wall surface portion **100***d*. The slanted wall portion **100***b***2** has one end connected to the first vertical wall portion **100***b***1** and the other end connected to the second vertical wall portion **100***b***3**. The slanted wall portion **100***b***2** is slanted so that the ink near the second wall surface portion **100***b* of the liquid receiving chamber **180** flows toward the liquid supply hole **110**. In other words, the slanted wall portion **100***b***2** has an inner surface **100***b***2***a* which is slanted closer to the liquid supply hole **110** from the other end which is an upper end to one end which is a lower end. In addition, the outer surface of the slanted wall portion **100***b***2** is also slanted similarly to the inner surface **100***b***2***a*.

As shown in FIG. **3**A, the liquid supply hole **110** is installed in the first wall surface portion **100***a* so that the ink in the liquid receiving chamber **180** flows outwards. The liquid supply hole **110** is installed at a partial center of the first wall surface portion **100***a*, at a portion closer to the third wall surface portion **100***c* rather than the second wall surface portion **100***b*. The liquid supply hole **110** communicates with a flow channel **114** formed in the first wall surface portion **100***a* so that the ink in the liquid receiving chamber **180** flows outwards (toward the print head, in this embodiment). As shown in FIGS. **3**D and **4**A, a sponge foam **112** is disposed in the liquid supply hole **110** to prevent the ink from leaking out of the liquid supply hole **110**.

As shown in FIGS. **3**A, **3**D and **4**A, the prism unit **170***t* is further disposed at the first wall surface portion **100***a*. The prism unit **170***t* is formed transparently by polypropylene. As shown in FIGS. **4**A to **4**C, the prism unit **170***t* has a prism **170** used for detecting a remaining amount of ink. The prism **170** has a right isosceles triangular prism shape and is disposed so that a reflective surface **170***f* (FIGS. **4**B and **4**C) is located in the liquid receiving chamber **180**. In addition, as shown in FIG. **4**A, the prism **170** is disposed to contact the inner surface of the second wall surface portion **100***b* (in detail, the first vertical wall portion **100***b***1**). By disposing as described above, it is possible to prevent the ink flowing from the second wall surface portion **100***b* to the liquid supply hole **110** from being blocked by the prism **170**. By doing so, the remaining amount of ink staying in the liquid receiving chamber **180** may be reduced so that the ink may be consumed efficiently.

The prism **170** reflects light variously in response to the refractive index of the fluid which contacts the reflective surface **170***f*. As shown in FIG. **4**B, in a case where the remaining amount of ink decreases so that the reflective surface **170***f* contacts the air, the light irradiated from a light emitting element **92** is reflected by the reflective surface **170***f* of the prism **170** and is incident to a light receiving element **94** due to the difference in refractive indexes of the prism **170** and the air. Meanwhile, as shown in FIG. **4**C, in a case where the ink is present in the liquid receiving chamber **180** so that the reflective surface **170***f* contacts the ink IK, since the reflective indexes of the prism **170** and the ink are identical, the light irradiated from the light emitting element **92** is refracted a little by the reflective surface **170***f* as shown in FIG. **4**C and advances into the ink IK. In other words, the remaining amount of ink may be detected by measuring the light which is incident to the light receiving element **94**.

As shown in FIGS. **3**A, **3**B and **4**A, a notch (channel) **140** is formed in the first vertical wall portion **100***b***1** of the second wall surface portion **100***b*. The notch **140** is installed at a position closer to the first wall surface portion **100***a* than a position where a terminal group **130***t* is installed. In detail, with respect to the height direction (the Z-axis direction), the notch **140** is installed at a location closer to the first wall surface portion **100***a* than a location where the terminal group **130***t* is installed. In addition, as shown in FIG. **3**B, the notch **140** is installed at the approximate center of the first vertical wall portion **100***b***1** in the width direction.

As shown in FIGS. **3**A and **4**A, the circuit board **130** having the terminal group **130***t* (which will be described later in detail) is installed to the slanted wall portion **100***b***2** of the second wall surface portion **100***b*. As shown in FIG. **3**A, with respect to the length direction (the X-axis direction), the notch **140** is installed to partially overlap the circuit board **130**. In other words, with respect to the mounted state where the cartridge **10** is mounted to the holder **20**, the circuit board **130** is located right above the notch **140**. In other words, when the cartridge **10** is vertically projected in the vertical direction (the Z-axis direction), the notch **140** is installed to partially overlap the circuit board **130**. In addition, with respect to the length direction (the X-axis direction), the notch **140** is more preferably installed to overlap a part of the terminal group **130***t* of the circuit board **130**. Here, the expression "the notch **140** overlaps a part of the terminal group **130***t* of the circuit board **130**" means that "an inclusive region **800** surrounded by a minimal polygon (in detail, a convex polygon of which all inner angles are smaller than 180 degrees) including the terminal group **130***t* overlaps the notch **140** at least partially." When mounted to the holder **20**, the circuit board **130** is electrically connected to the control unit **60** (FIG. **1**) of the printer **1** to transmit various information (signals) with the printer **1**. In addition, details of the circuit board **130** will be described later.

As shown in FIGS. **3**A and **4**A, the lever **120** is installed to the second wall surface portion **100***b*. Specifically, the lower end surface of the lever **120** is mounted to the slanted wall portion **100***b***2**. In addition, the lever **120** extends upwards from the lower end surface. The lever **120** has elasticity such that the lever **120** is elastically deformed in the length direction (X-axis direction) by an external force. The lever **120** has a container-side regulating unit **124** and an engagement releasing unit **122**. The container-side regulating unit **124** is engaged to the holder **20**, described later, to regulate the

movement of the cartridge **10** in the height direction. In detail, the container-side regulating unit **124** regulates the movement of the second wall surface portion **100***b* in the height direction. The engagement releasing unit **122** is a region to which an external force is applied by a user, and the engagement releasing unit **122** is used for releasing the engagement between the holder **20** and the container-side regulating unit **124**. The engagement releasing unit **122** has a first side surface **122***t* which faces the second wall surface portion **100***b* and a second side surface **122***u* opposite to the first side surface **122***t*. When the first side surface **122***t* contacts the second wall surface portion **100***b*, the second side surface **122***u* is slanted to be closer to a rotation point **166***w*, described later, from the upper end to the lower end. The slant of the second side surface **122***u* in the above direction will be hereinafter referred to as a "lower slant".

As shown in FIGS. **3**A, **3**C and **4**A, a protrusion unit **160** is installed at a center region of the third wall surface portion **100***c*, at a region where the height is half or less in the height direction. The protrusion unit **160** is used for regulating the movement of the cartridge **10** after the cartridge **10** is mounted to the holder **20**. Specifically, the protrusion unit **160** regulates the movements of the third wall surface portion **100***c* of the cartridge **10** in the width direction and in the height direction. The protrusion unit **160** has a width Wt (FIG. **3**C). The details will be described later.

As shown in FIGS. **3**A and **3**C, the third wall surface portion **100***c* has a rotation point **166***w* which will contact the holder **20** and become a point of rotation, when the cartridge **10** is detached from the holder **20** by rotation. This rotation point **166***w* is located below an engagement point where the holder **20** is engaged with the container-side regulating unit **124** in the height direction. In other words, the rotation point **166***w* is located below the engagement releasing unit **122** in the height direction. In addition, an atmosphere opening hole (not shown) for introducing air to the inside as the ink in the liquid receiving chamber **180** is consumed is formed in the third wall surface portion **100***c*.

FIGS. **5**A and **5**B are diagrams for illustrating the circuit board **130**. FIG. **5**A shows the surface of the circuit board **130**. FIG. **5**B shows the circuit board **130**, observed from the side. The surface of the circuit board **130** is a surface exposing to the outside when the circuit board **130** is mounted to the cartridge **10**. In addition, the arrow Zt shown in FIG. **5**A represents an inserting direction of the cartridge **10** to the holder **20**.

As shown in FIG. **5**A, a boss notch **131** is formed in the upper end portion of the circuit board **130**, and a boss hole **132** is formed at the lower end portion of the circuit board **130**. The boss notch **131** and the boss hole **132** are used for easily mounting the circuit board **130** to the container body **100**.

The circuit board **130** has a terminal group **130***t* composed of nine terminals **130***a* to **130***i* disposed at the surface and a storage unit **133**. The storage unit **133** disposed at the opposite surface stores information (for example, the remaining amount of ink or the ink color) about the ink of the cartridge **10**. The terminals **130***a* to **130***i* have an approximately spherical shape and are arranged to form two rows which are approximately perpendicular to the inserting direction Zt. Among two rows, the row located at a rear side in the inserting direction Z, namely located at a lower side in FIG. **5**A, is called a lower row (a first row), and the row located at a front side in the inserting direction Z, namely located at an upper side in FIG. **5**A, is called an upper row (a second row). In addition, as described above, an appearance of the inclusive region **800** surrounded by a minimal convex polygon including the terminal group **130***t* is depicted with a dotted line. In this embodiment, the inclusive region **800** is a hexagon.

The center portion of each terminal **130***a* to **130***i* includes a contact portion cp which respectively contacts a corresponding terminal of the device, mounted to the holder **20**. Each contact portion cp of the terminals **130***a* to **130***d* of the upper row and each contact portion cp of the terminals **130***e* to **130***i* of the lower row are arranged to cross each other into a so-called zigzag pattern. In addition, the terminals **130***a* to **130***d* of the upper row and the terminals **130***e* to **130***i* of the lower row are arranged to cross each other into a zigzag pattern so that the center of the terminals is not in line with the inserting direction Zt. In addition, the circuit board **130** is mounted to the cartridge **10** so that as many terminals as close to the notch **140** of the cartridge **10** are included. In other words, the circuit board **130** is mounted to the cartridge **10** so that the lower row (the first row) is located lower than the upper row (the second row) in the height direction of the cartridge **10**.

The terminals **130***a* to **130***d* of the upper row and the terminals **130***e* to **130***i* of the lower row respectively have the following functions (usages).

<Upper Row>

(1) Mounting detection terminal **130***a*

(2) Reset terminal **130***b*

(3) Clock terminal **130***c*

(4) Mounting detection terminal **130***d*

<Lower Row>

(5) Mounting detection terminal **130***e*

(6) Power terminal **130***f*

(7) Grounding terminal **130***g*

(8) Data terminal **130***h*

(9) Mounting detection terminal **130***i*

Four mounting detection terminals **130***a*, **130***d*, **130***e* and **130***i* are used for detecting whether the electric contact with a terminal of the device is acceptable, and they may also be called "contact detection terminals". Five other terminals **130***b*, **130***c*, **130***f*, **130***g* and **130***h* are terminals for the storage unit **133**.

A-3. Configuration of Holder

Next, the detailed configuration of the holder **20** will be described with reference to FIGS. **6**A to **8**. FIGS. **6**A and **6**B are diagrams for illustrating the holder **20**. FIG. **6**A is a first perspective view showing an appearance of the holder **20**, and FIG. **6**B is a second perspective view showing the appearance of the holder **20**. In addition, the second perspective view does not show a part of the outer circumferential wall of the holder **20** for the convenience of description. FIGS. **7**A and **7**B are diagrams for illustrating the detailed configuration of an opposite wall surface portion **25***c*. FIG. **7**A is a view of the opposite wall surface portion **25***c*, observed in the X-axis positive direction. FIG. **7**B is a partial enlarged view of FIG. **7**A. FIG. **8** is a sectional view taken along the line VIII-VIII of FIG. **6**A.

As shown in FIG. **6**A, the holder **20** has a concave shape in which a part of the holder **20** is opened so that the cartridge **10** may be attached or detached. The holder **20** includes a device-side bottom wall surface portion (also called a "bottom surface portion") **25***a*, an engagement-side wall surface portion (a "front surface portion") **25***b*, an opposite wall surface portion (also called a "rear surface portion") **25***c*, a first device-side side wall surface portion (also called a "left side surface portion") **25***e*, and a second device-side side wall surface portion (also called a "right side surface portion") **25***f*. By means of these wall surface portions **25***a*, **25***b*, **25***c*, **25***e* and

25*f*, a cartridge receiving chamber for receiving the cartridge **10** is formed. Each wall surface portion **25***a*, **25***b*, **25***c*, **25***e* and **25***f* is made of a synthetic resin such as polypropylene.

The device-side bottom wall surface portion **25***a* configures a lower surface with respect to a usage posture of the printer **1**. The opposite wall surface portion **25***c*, the engagement-side wall surface portion **25***b*, the first device-side side wall surface portion **25***e* and the second device-side side wall surface portion **25***f* stand from the device-side bottom wall surface portion **25***a*. The opposite wall surface portion **25***c* and the engagement-side wall surface portion **25***b* are opposite to the first device-side side wall surface portion **25***e* and the second device-side side wall surface portion **25***f*.

The liquid supply tube **240** and the seal member **242** are mounted to the device-side bottom wall surface portion **25***a*. One end of the liquid supply tube **240** is connected to a print head **21** (FIG. **8**) mounted to the rear surface (the surface in the Z-axis negative direction) of the device-side bottom wall surface portion **25***a*. In addition, when the cartridge **10** is mounted to the holder **20**, the other end of the liquid supply tube **240** is connected to the liquid supply hole **110** (FIG. **3**A) of the cartridge **10**. The seal member **242** is a member with elasticity such as a synthetic resin. The seal member **242** is disposed around the liquid supply tube **240** so as to prevent the ink from leaking out when the cartridge **10** is mounted to the holder **20**. In addition, as shown in FIG. **8**, a porous metallic filter **240***t* partially contacting the foam **112** (FIG. **4**A) in the liquid supply hole **110** is installed at the other end of the liquid supply tube **240**. This filter **240***t* may employ for example a stainless steel mesh or a stainless steel non-woven fabric. In addition, the filter **240***t* may be excluded.

As shown in FIG. **6**B, four through holes **290** (only three through holes are shown in the figure) and four first device-side regulating units **270** (only three first device-side regulating units are shown in the figure) are installed at the device-side bottom wall surface portion **25***a* in correspondence with the number (four) of the cartridges **10** mounted. Further, four contact mechanisms **280** (only three contact mechanisms are shown in the figure) are disposed at the device-side bottom wall surface portion **25***a* in correspondence with the number of the cartridges **10** mounted.

The through holes **290** are used for detecting the remaining amount of ink in the cartridge **10** by using an optical detection device, described later, installed to the Z-axis negative direction side of the holder **20**. Specifically, the through holes **290** allow the light emitting from the optical detection device to transmit therethrough and allow the light reflected by the cartridge **10** to transmit therethrough.

The first device-side regulating unit **270** has a protrusion shape. In addition, the first device-side regulating unit **270** has a shape sharpened upwards. The notch **140** serving as the first regulating unit of the cartridge **10** is inserted into the first device-side regulating unit **270** to regulate the movement of the cartridge **10** in the width direction (the Y-axis direction). In addition, the first device-side regulating unit **270** is also called a regulation pin **270**. The regulation pin **270** may be formed integrally with the holder **20** as in this embodiment or may be mounted to the device-side bottom wall surface portion **25***a* as a separate unit.

The contact mechanism **280** is used for electrically connecting the control unit **60** of the printer **1** to the circuit board **130** of the cartridge **10**. The contact mechanism **280** includes a plurality of electric contact members (also called "terminals") **280***a* to **280***i* for contacting the terminals **130***a* to **130***i* of the circuit board **130**. The number of the electric contact members **280***a* to **280***i* corresponds to the number of the terminals **130***a* to **130***i* (FIG. **5**A) of the circuit board **130**, which is nine in this embodiment. In addition, the contact mechanisms **280** are electrically connected to the control unit **60**.

Further, the holder **20** has a device-side engagement unit **260** disposed adjacent to the engagement-side wall surface portion **25***b*. The device-side engagement unit **260** is located at a predetermined height from the device-side bottom wall surface portion **25***a*. The device-side engagement unit **260** is engaged with the container-side regulating unit **124** (FIG. **3**B) of the cartridge **10** in order to regulate the movement of the cartridge **10** in the height direction when the cartridge **10** is mounted.

As shown in FIG. **7**A, the opposite wall surface portion **25***c* includes a standing wall portion **216**, a guide channel **200***t*, and a hole portion **202** formed in the standing wall portion **216**. With respect to the usage posture, the standing wall portion **216** extends upwards (in the Z-axis positive direction) from the device-side bottom wall surface portion **25***a*. The standing wall portion **216** includes an opposite surface **216***u*, an extension surface **216***t*, and an upper surface **216***s* in the order from the below. With respect to the usage posture, the opposite surface **216***u* extends right upwards from the device-side bottom wall surface portion **25***a*. In other words, the opposite surface **216***u* forms a surface approximately parallel with the outer surface of the third wall surface portion **100***c* (FIG. **3**A) of the cartridge **10** with respect to the mounted state where the cartridge **10** is mounted to the holder **20**. For easier understanding, a single hatching is given to the opposite surface **216***u*.

The extension surface **216***t* extends out of the holder **20** from the upper end of the opposite surface **216***u*. In other words, with respect to the mounted state, the extension surface **216***t* extends in a direction away from the outer surface of the third wall surface portion **100***c* (FIG. **3**A) of the cartridge **10**. In this embodiment, the extension surface **216***t* configures a slanted surface which is slanted with respect to the vertical direction. In addition, the opposite wall surface portion **25***c* has a rotation point **216***w* corresponding to the rotation point **166***w* of the cartridge **10**. The rotation point **216***w* is regulated by the border between the opposite surface **216***u* and the extension surface **216***t*. In other words, the rotation point **216***w* may be also called the upper end of the opposite surface **216***u*.

The upper surface **216***s* extends upwards from the lower end of the extension surface **216***t* with respect to the usage posture of the printer **1**. The upper surface **216***s* is also slanted with respect to the vertical direction, similar to the extension surface **216***t*.

As shown in FIG. **8**, by forming the opposite surface **216***u*, the extension surface **216***t* and the upper surface **216***s*, a space portion **216***sp* in which the cartridge **10** may be partially received when the cartridge **10** is turned and detached is formed.

Referring to FIGS. **7**A and **7**B again. The protrusion unit **160** (FIG. **3**A) of the cartridge **10** is inserted into the approximately spherical hole portion **202**. By doing so, with respect to the mounted state, the movement of the cartridge **10** in the width direction (the Y-axis direction) and the height direction (Z-axis direction) are regulated within a predetermined range. In addition, the width Wb of the hole portion **202** is approximately identical to the width Wt of the protrusion unit **160** of the cartridge **10**. In addition, for the attaching/detaching operation of the cartridge **10** to/from the holder **20** by the rotating operation described later, the gap of the protrusion unit **160** (FIG. **3**C) of the cartridge **10** in the hole portion **202** of the holder **20** in the height direction is greater than the gap in the width direction.

The guide channel **200***t* guides the protrusion unit **160** to the hole portion **202** while regulating the movement of the cartridge **10** in the width direction when the cartridge **10** is mounted to the holder **20**. As shown in FIG. **7**B, the guide channel **200***t* is formed from the upper end of the opposite wall surface portion **25***c* over the hole portion **202**. In addition, for easier understanding, in FIG. **7**B, a single hatching is given to the hole portion **202**. By providing the guide channel **200***t*, there is no necessity to provide another embodiment such as a partition wall for positioning the cartridge **10** to the holder **20**, and therefore the holder **20** may become smaller. In addition, the upper end of the guide channel **200***t* may not be located at the upper end of the opposite wall surface portion **25***c* but may be located in a middle of the opposite wall surface portion **25***c* in the height direction.

The width Wa of the upper end **200***ta* of the guide channel **200***t* is greater than the width Wb of the lower end **200***tb*. In addition, the lower end **200***tb* has the same width as the hole portion **202**. In addition, the width Wa of the upper end **200***ta* is greater than the width Wt (FIG. **3**C) of the protrusion unit **160** of the cartridge **10**. In addition, the width of the guide channel **200***t* is monotonously reduced as the lower end **200***tb* (namely, the hole portion **202**) is approached from the upper end **200***ta*. Here, the term "monotonous reduction" means that a region with a consistent width may be included if the width does not increase in any region from the upper end **200***ta* to the lower end **200***tb*. In more detail, the guide channel **200***t* has a lower guide channel **200***tu* which is tapered to have a gradually decreasing width as being closer to the hole portion **202**. In addition, a border between the lower guide channel **200***tu* and other parts is depicted with a broken line.

As shown in FIGS. **7**A and **8**, the opposite wall surface portion **25***c* has a deformation unit **212** which may be elastically deformed in the depth direction (X-axis direction, a direction in which the opposite wall surface portion **25***c* is opposite to the device-side engagement unit **260**) of the guide channel **200***t*. In other words, the deformation unit **212** is configured to be deformable toward the outside of the cartridge receiving chamber which receives the cartridge **10**. The deformation unit **212** is formed by giving the notches **214** to both ends of a channel bottom wall surface portion **213** which configures the bottom surface of the guide channel **200***t*. The notch **214** is formed through the channel bottom wall surface portion **213**. The deformation unit **212** grows over a predetermined height in a central portion of the channel bottom wall surface portion **213** from the region contacting the hole portion **202**. The predetermined height represents a region higher than the intersection point where the channel bottom wall surface portion **213** intersects the trajectory of the rotating protrusion unit **160** (FIG. **4**A) when the cartridge **10** is mounted in a predetermined method. In addition, the details will be described later.

A-4. Installation of Cartridge

FIGS. **9**A and **9**B are diagrams for illustrating a mounted state of the cartridge **10** to the holder **20**. FIG. **9**A is a first view showing that the cartridge **10** is mounted, and FIG. **9**B is a second view showing that the cartridge **10** is mounted. FIGS. **9**A and **9**B show a section of the cartridge **10** taken along the line IX-IX of FIG. **3**B and a section of the holder **20** corresponding to the IX-IX section. Hereinafter, a general mounting method (a normal mounting method) which is generally adopted when a user mounts the cartridge **10** to the holder **20** will be described.

In the normal mounting method, as shown in FIG. **9**A, the cartridge **10** is mounted to the holder **20** by being slanted so that the protrusion unit **160** of the third wall surface portion **100***c* contacts the opposite wall surface portion **25***c*. In detail, while the protrusion unit **160** is inserted into the guide channel **200***t*, the cartridge **10** is moved to a right lower position represented by the arrow Zw. At this time, since the width Wa of the upper end of the guide channel **200***t* is greater than the width Wt of the protrusion unit **160** of the cartridge **10**, the protrusion unit **160** may be easily inserted into the guide channel **200***t*.

As shown in FIG. **9**B, in a case where the protrusion unit **160** of the cartridge **10** is moved to a location where the protrusion unit **160** contacts the deformation unit **212** so that an external force is applied to the protrusion unit **160**, the deformation unit **212** is elastically deformed toward the outside (X-axis negative direction). As described above, as the deformation unit **212** is elastically deformed, the cartridge **10** may be smoothly mounted to the holder **20**.

FIGS. **10**A and **10**B are second views for illustrating a mounted state of the cartridge to the holder. FIG. **10**A shows a section of the cartridge **10** taken along the line XA-XA of FIG. **3**B and a section of the holder **20** corresponding to the XA-XA section, similar to FIGS. **9**A and **9**B. In addition, FIG. **10**B is a perspective view showing the vicinity of the regulation pin **270** of FIG. **10**A.

As shown in FIG. **10**A, if the cartridge **10** is moved further to the right lower location, the protrusion unit **160** is easily inserted into the hole portion **202** by the guidance of the guide channel **200***t*. In this state, the container-side regulating unit **124** of the cartridge **10** is not engaged with the device-side engagement unit **260** of the holder **20**.

If the protrusion unit **160** is inserted into the hole portion **202**, as shown in FIG. **10**B, the regulation pin **270** of the holder **20** is inserted into the notch **140** of the cartridge **10**. In this state, by pushing the second wall surface portion **100***b* to a right lower position, the container-side regulating unit **124** is engaged with the device-side engagement unit **260**. In this pushing operation, since the movement of the second wall surface portion **100***b* to which the circuit board **130** is mounted in the width direction is regulated, the cartridge **10** may be precisely positioned with respect to the holder **20**. In other words, after the mounting, the possibility that a device-side terminal **280***t* (though nine terminals are present, it is just called the device-side terminal **280***t* for convenience) of the contact mechanism **280** does not contact each terminal **130***a* to **130***i* (FIGS. **5**A and **5**B) of the circuit board **130** of the cartridge **10** may be decreased. In addition, since the notch **140** is installed at a location closer to the first wall surface portion **100***a* rather than the circuit board **130**, when the cartridge **10** is mounted to the holder **20**, the regulation pin **270** is inserted into the notch **140** of the cartridge **10** before each terminal **130***a* to **130***i* of the circuit board **130** contacts the device-side terminal **280***t* of the contact mechanism **280**. In other words, in a state where the regulation pin **270** is inserted into the notch **140** and the movement of the cartridge **10** in the width direction (the Y-axis direction) is regulated to some extent, each terminal **130***a* to **130***i* of the circuit board **130** may contact the contact mechanism **280**. Therefore, when the cartridge **10** is mounted to the holder **20**, each terminal **130***a* to **130***i* may securely contact the contact mechanism **280**.

As described above, since the guide channel **200***t* is formed in the opposite wall surface portion **25***c*, the protrusion unit **160** may be easily guided to the hole portion **202**. In particular, since the guide channel **200***t* has the lower guide channel **200***tu*, the protrusion unit **160** may be more smoothly guided to the hole portion **202**.

FIGS. **11**A and **11**B is a diagram for illustrating a state after the mounting. FIG. **11**A shows a section of the cartridge **10** taken along the line XIA-XIA of FIG. **3**B and a section of the holder **20** corresponding to the XIA-XIA section, similar to FIGS. **9**A and **9**B. In addition, FIG. **11**B is a perspective view showing the mounted state. In FIG. **11**A, the ink received in the liquid receiving chamber **180** is depicted with dots.

As shown in FIG. **11**A, in the mounted state, the container-side regulating unit **124** is engaged with the device-side engagement unit **260** so that the movement of the cartridge **10** in the height direction is regulated. Here, with respect to the vertical direction (the Z-axis direction) in the usage posture of the holder **20**, the rotation point **216***w* is located below an engagement point **124***t*. In the mounted state, the lever **120** is engaged with the device-side engagement unit **260** in a state of being closer to the second wall surface portion **100***b* rather than a non-loaded state. Therefore, the movement of the cartridge **10** in the length direction (the X-axis direction) is regulated as the lever **120** presses the container body **100** to the opposite wall surface portion **25***c*. In addition, in the mounted state, the liquid supply tube **240** is connected to the liquid supply hole **110**. In addition, each terminal of the circuit board **130** contacts each corresponding electric contact member **280***a* to **280***i* of the contact mechanism **280** to transmit various kinds of information such as the ink color and the remaining amount of ink between the cartridge **10** and the control unit **60** (FIG. **1**) of the printer **1**. Further, a remaining amount of ink is detected at a predetermined timing by using the optical detection device **90**. In addition, in the mounted state, the ink is supplied to the print head **21** via the liquid supply hole **110** and the liquid supply tube **240** by the suction of the print head **21**.

With respect to the mounted state, the movement of the cartridge **10** is generally regulated by the hole portion **202** of the holder **20**, the device-side engagement unit **260** and the regulation pin **270**. In detail, the hole portion **202** and the protrusion unit **160** cooperate to regulate the movement in the width direction (the Y-axis direction) and the height direction (the Z-axis direction) of the third wall surface portion **100***c*, the device-side engagement unit **260** and the container-side regulating unit **124** cooperates to regulate the movement in the height direction of the second wall surface portion **100***b*, and the regulation pin **270** and the notch **140** cooperate to regulate the movement in the width direction of the second wall surface portion **100***b*.

Here, to perform the printing process or the like, the holder **20** and the cartridge **10** move in the main scanning direction (the Y-axis direction, or the width direction of the cartridge **10**). In other words, the cartridge **10** receives an external force (an inertial force) in the width direction. Since the cartridge **10** receives an external force, as shown in FIG. **11**B, the cartridge **10** rotates in a rotation direction with a width directional component centered around the liquid supply hole **110** (FIG. **11**A). In detail, the second wall surface portion **100***b* rotates in the direction of the arrow YR1, and the third wall surface portion **100***c* rotates in the direction of the arrow YR2. Here, the circuit board **130** is installed to the second wall surface portion **100***b*. Therefore, by providing the notch **140** for regulating the movement in the width direction to the second wall surface portion **100***b*, the movement (distortion) of the circuit board **130** with respect to the holder **20** may be suppressed rather than by providing the notch **140** to the first wall surface portion **100***a*. By doing so, the electric connection between the circuit board **130** (in detail, the terminal group **130***t*) and the printer **1** may be maintained in a good state after the mounting. In particular, in this embodiment, as described above, the circuit board **130** is disposed to partially overlap with the notch **140** in the length direction (FIG. **3**A). Therefore, the movement (misalignment) of the circuit board **130** (in detail, the terminal group **130***t*) with respect to the holder **20** may be suppressed to the minimum. Further, as described above, the notch **140** is more preferably installed to overlap with a part of the terminal group **130***t* of the circuit board **130** with respect to the length direction (the X-axis direction). By doing so, the movement (misalignment) of the terminal group **130***t* with respect to the holder **20** may be further suppressed to the minimum.

In addition, in a case where a channel for regulating the movement in the width direction is provided to the first wall surface portion (the bottom surface portion) **100***a*, a member for forming (defining) the channel is required peripherally. In this embodiment, the notch **140** for regulating the movement in the width direction is provided to the second wall surface portion **100***b* so that the size of the cartridge in the length direction (the X-axis direction) may be reduced.

In addition, the notch **140** may suppress the movement of the prism **170** in the width direction by cooperating with the regulation pin **270**. In particular, in this embodiment, the prism **170** is disposed in contact with the inner surface of the second wall surface portion **100***b* having the notch **140** (FIG. **4**A). By doing so, the movement (misalignment) of the prism **170** in the width direction may be suppressed to the minimum so that the remaining amount of ink may be detected with good precision. Further, the possibility that the flow of the ink flowing toward the liquid supply hole **110** is blocked by the prism **170** may be decreased. By doing so, the ink in the liquid receiving chamber **180** may be consumed efficiently, which may reduce the remaining amount of ink.

In addition, by forming the notch **140** as the first regulating unit, when the cartridge **10** is attached to or detached from the holder **20**, the possibility that the first regulating unit (the notch **140**) interferes the holder **20** may be decreased, rather than the case where the first regulating unit has a protrusive shape (in this case, the first device-side regulating unit **270** has a concave state). By doing so, the occurrence of any inconvenience such as the breakdown of the cartridge **10** or the holder **20** may be suppressed.

As described above, since the cartridge **10** has the notch **140** for regulating the movement in the width direction at the second wall surface portion **100***b* to which the circuit board **130** is mounted, a misalignment of the circuit board **130** to the holder **20** may be suppressed. Therefore, the possibility that the electric connection between the circuit board **130** and the printer **1** is blocked may be decreased. In addition, since the misalignment of the circuit board **130** to the holder **20** may be suppressed, many terminals may be provided by the circuit board **130**. By doing so, it becomes possible to transmit more information between the circuit board **130** and the printer **1**.

A-5. Detachment of Cartridge

FIGS. **12**A and **12**B are diagrams for illustrating a detached state of the cartridge **10** from the holder **20**. FIG. **12**A is a first view showing a detaching posture, and FIG. **12**B is a view for illustrating one of the effects of this embodiment. In addition, FIG. **12**A shows a section of the cartridge **10** taken along the line XIIA-XIIA of FIG. **3**B and a section of the holder **20** corresponding to the XIIA-XIIA section.

As shown in FIG. **12**A, in order to detach the cartridge **10** from the holder **20**, the engagement releasing unit **122** is elastically deformed in an approaching (pressing) direction (the X-axis negative direction) toward the container body **100** (in detail, the second wall surface portion **100***b*). Then, the engagement of the device-side engagement unit **260** and the

container-side regulating unit **124** is released. The engagement releasing unit **122** is formed so that the second side surface **122***u* is slanted a predetermined angle θ from the vertical direction, in a case where the first side surface **122***t* contacts the second wall surface portion **100***b*. By forming the engagement releasing unit **122** as described above, if an external force F is added to the engagement releasing unit **122** in the X-axis negative direction, the engagement may be released and at the same time the cartridge **10** may be detached from the holder **20** efficiently. The reason will be described with reference to FIG. **12**B.

As shown in FIG. **12**B, in order to release the engagement, the case where an external force F is added to the engagement releasing unit **122** in the approaching direction (the X-axis negative direction) in which the engagement releasing unit **122** approaches the container body **100** (in detail, the second wall surface portion **100***b*) is considered. The external force F may be decomposed into a force F1 of a tangential component of a circumference based on the rotation point **216***w* and a radial component F2. If the second side surface **122***u* is slanted (slanted downwards) to be closer to the rotation point **216***w* from the upper end to the lower end, the force F1 of the tangential component may be efficiently transferred to the engagement releasing unit **122**. Therefore, in a case where the external force is added to the engagement releasing unit **122** in the direction (the X-axis negative direction) in which the engagement of the container-side regulating unit **124** and the device-side engagement unit **260** is released, the engagement may be released and the cartridge **10** may be easily rotated in a direction (the arrow Rd) in which the cartridge **10** is detached.

FIGS. **13**A and **13**B are second views for illustrating a posture of detaching the cartridge **10** from the holder **20**. FIG. **13**A is a view showing that the cartridge **10** rotates centered around the rotation point **216***w*. FIG. **13**B is a second view showing that the cartridge **10** rotates centered around the rotation point **216***w*. In addition, FIGS. **13**A and **13**B show a section of the cartridge **10** taken along the line XIII-XIII of FIG. **3**B and a section of the holder **20** corresponding to the XIII-XIII section.

As shown in FIG. **13**A, if an external force F of a predetermined directional component (the X-axis negative directional component) is added to the engagement releasing unit **122**, the cartridge **10** is rotated in the direction of the arrow Rd centered around the rotation point **216***w*. In addition, since the space portion **216***sp* is located above the rotation point **216***w*, the rotation of the cartridge **10** in the predetermined direction is not disturbed by the holder **20**.

As shown in FIG. **13**B, if the rotation in the predetermined direction is performed, the third wall surface portion **100***c* of the cartridge **10** contacts the upper surface **216***s*. In this state, the rotation in the predetermined direction is interfered since the upper surface **216***s* becomes a barrier. However, in this state, a user may easily grip and handle the second wall surface portion **100***b* of the cartridge **10** so that the second wall surface portion **100***b* may be lifted up in the vertical direction with respect to the holder **20**.

As described above, the cartridge **10** is configured so that the rotation point **166***w* is located below the engagement point **124***t* and the engagement releasing unit **122** is located above the engagement point **124***t* (FIG. **11**A). Therefore, as shown in FIG. **12**A, by applying an external force in a predetermined direction (the X-axis negative direction) to the engagement releasing unit **122**, the cartridge **10** may be easily detached from the holder **20** at the rotation point **216***w*. In other words, the manipulation for releasing the engagement of the container-side regulating unit **124** and the device-side engagement unit **260** and the manipulation for detaching the cartridge **10** from the holder **20** may be performed in series (FIGS. **12**A to **13**B). Therefore, a user may be provided with the holder **20** and the ink cartridge **10** with an improved releasing manipulation. In addition, the rotation point **216***w* of the holder **20** may be easily defined by the opposite surface **216***u* and the extension surface **216***t* of the opposite wall surface portion **25***c*.

A-6. Installation of Cartridge in Various Methods

FIGS. **14**A to **14**C are diagrams for illustrating various mounting methods. FIGS. **14**A to **14**C are depicted in time series. In addition, FIGS. **14**A to **14**C show a section of the cartridge **10** taken along the line XIV-XIV of FIG. **3**B and a section of the holder **20** corresponding to the XIV-XIV section. With reference to FIGS. **14**A to **14**C, a mounting method (an engagement mounting method) for slanting the cartridge **10** so that the second wall surface portion **100***b* is located right below the third wall surface portion **100***c* and therefore being inserted into the holder **20** will be described.

As shown in FIG. **14**A, in the engagement mounting method, before the protrusion unit **160** is inserted into the hole portion **202**, the container-side regulating unit **124** is engaged with the device-side engagement unit **260**. In this case, the cartridge **10** is mounted to the holder **20** by rotating the cartridge **10** centered around the engagement point **124***t* as the rotation point. At this time, the protrusion unit **160** moves along a rotating trajectory Rm. This rotating trajectory Rm intersects the deformation unit **212**. In other words, the deformation unit **212** is located at the point where the rotating trajectory Rm intersects the holder **20**. In other words, with respect to the usage posture, the deformation unit **212** is formed at the center of the channel bottom wall surface portion **213** to reach a location higher than the cross point Rx where the rotating trajectory Rm intersects the channel bottom wall surface portion **213**. As shown in FIG. **14**A, in a state just after the protrusion unit **160** contacts the channel bottom wall surface portion **213**, the protrusion unit **160** contacts the deformation unit **212**.

As shown in FIG. **14**B, if the third wall surface portion **100***c* is pushed downwards in the vertical direction, the deformation unit **212** is pushed in the outer direction (the X-axis negative direction) of the holder **20** by the protrusion unit **160** and is elastically deformed. As the deformation unit **212** is elastically deformed, the third wall surface portion **100***c* may be pushed downwards in the vertical direction without restricting the movement of the cartridge **10**. By doing so, as shown in FIG. **14**C, the cartridge **10** may be mounted to the holder **20**.

FIGS. **15**A and **15**B are diagrams for illustrating various mounting methods. FIG. **15**A is a first view for illustrating a mounting method to the holder **20**. FIG. **15**B is a second view for illustrating the mounting method to the holder **20**. FIGS. **15**A and **15**B show a section of the cartridge **10** taken along the line XV-XV of FIG. **3**B and a section of the holder **20** corresponding to the XV-XV section.

FIG. **15**A shows a mounting method (an upper side access mounting method) for mounting the cartridge **10** to the holder **20** from a location just above the holder **20** without slanting the cartridge **10**. Even in this mounting method, since the deformation unit **212** may be elastically deformed, the cartridge **10** may be mounted to the holder **20** without restricting the movement of the cartridge **10**.

FIG. **15**B shows a mounting device (a front access mounting method) for mounting the cartridge **10** to the holder **20** without inserting the protrusion unit **160** to the guide channel

200*t*. In this embodiment, since the holder **20** has the deformation unit **212**, the possibility that the movement of the cartridge **10** is restricted so that the cartridge **10** may not be mounted to the holder **20** may be decreased. Therefore, a method for preventing the mounting in a specific mounting method (a mounting method in which the movement is restricted or the like) may not be provided to the passage of the holder **20**. Therefore, the cartridge **10** may also be mounted to the holder **20** according to the front access mounting method.

As described, as the holder **20** has the deformation unit **212**, before the cartridge **10** is mounted to the holder **20**, the possibility that the movement of the cartridge **10** is restricted in the holder **20** may be decreased. By doing so, it is not necessary to provide a mechanism for prohibiting a specific mounting method to the passage of the holder **20**, and therefore the manipulation when mounting the cartridge **10** to the holder **20** may be improved while decreasing the number of parts of the holder **20**. In other words, a user may mount the cartridge **10** to the holder **20** using various mounting methods without being limited to any specific mounting method.

B. Second Embodiment

FIGS. **16**A and **16**B are diagrams for illustrating a cartridge **10***a* of a second embodiment. FIG. **16**A is a sectional of the cartridge **10***a*, which corresponds to the XVIA-XVIA section of FIG. **3**B. In addition, FIG. **16**B is a view for illustrating prisms **170***a* to **170***c* of the cartridge **10***a*. In addition, the prisms **170***a* to **170***c* are different from those of the first embodiment, and other configurations are identical to those of the first embodiment, so the same reference numeral is given to the same component and is not described in detail here. In addition, the configuration of the holder **20** to which the cartridge **10***a* is mounted and the configuration of the printer **1** are identical to those of the first embodiment.

As shown in FIG. **16**A, the first to third prisms **170***a* to **170***c* are installed to the first wall surface portion **100***a*. As shown in FIG. **16**B, each prism **170***a* to **170***c* includes a portion with a right isosceles triangular prism shape which includes the reflective surface **170***f*. In addition, the prisms **170***a* to **170***c* are disposed to have different distances between the reflective surfaces and the first wall surface portion **100***a*. In detail, the prism closer to the notch **140** is disposed to have a longer distance from the first wall surface portion **100***a*. In other words, among the prisms **170***a* to **170***c*, the first prism **170***a* with a greatest height is disposed to contact the inner surface of the second wall surface portion **100***b* to which the notch **140** is installed. In addition, as the height of the prism is lower, the prism is disposed at a location away from the second wall surface portion **100***b*. By disposing the first to third prisms **170***a* to **170***c* as described above, as the prism is disposed closer to the notch **140**, the distance between the reflective surface **170***f* and the optical detection device (not shown) disposed in the Z-axis negative direction is increased. In addition, the number of optical detection devices corresponding to the number of prisms may be disposed to the printer **1** to detect a remaining amount of ink, and a single optical detection device may be moved just below the prisms **170***a* to **170***c* to detect a remaining amount of ink.

As described above, by disposing a plurality of prisms **170***a* to **170***c* whose reflective surfaces **170***f* have different heights, the remaining amount of ink of the cartridge **10***a* may be detected in more detail. In addition, as the distance between the optical detection device and the reflective surface **170***f* is increased, the difference in relative locations of the reflective surface **170***f* and the optical detection device is increased so that the detection precision of the remaining amount of ink tends to be deteriorated. However, in this embodiment, as the distance between the optical detection device and the reflective surface **170***f* is greater, the prism **170***a* is disposed closer to the notch **140** as much so that the distortion with respect to the holder **20** may be suppressed. Therefore, the difference in detection precision on the remaining amount of ink using the prisms **170***a* to **170***c* may be decreased. In addition, since the cartridge **10***a* of the second embodiment has the notch **140** as in the first embodiment, the movement in the width direction (the Y-axis direction) may be regulated in cooperation with the regulation pin **270** of the holder **20**. Therefore, the electric connection of the circuit board **130** (in detail, the terminal group **130***t*) and the printer **1** may be maintained in a good state.

C. Modified Examples

In addition, among the components in the above embodiments, components other than those written in an independent claim are additional components, and they may be suitably excluded. In addition, the invention is not limited to the above embodiments or examples, but various modified examples can be made within the scope of the invention as follows for example.

C-1. First Modified Example

Even though the prism **170**, **170***a* is disposed in contact with the inner surface of the second wall surface portion **100***b* in the above embodiments (FIGS. **4**A and **16**A), the prism may be disposed away from the second wall surface portion **100***b* without being limited thereto. Even in this configuration, the movement (misalignment) of the circuit board **130** with respect to the holder **20** may be suppressed. In this case, the following modified examples may be preferably adopted. FIGS. **17**A to **17**E are diagrams for illustrating modified examples of the first modified example. FIGS. **17**A to **17**E are diagrams showing the vicinity of the prism **170**. The prism **170** is disposed away from the inner surface of the first vertical wall portion **100***b***1**, and protrusive members **175***a* to **175***e* are installed between the prism **170** and the first vertical wall portion **100***b***1**, different from the first embodiment. Other configurations are identical to those of the first embodiment, and the same configuration is represented with the same reference numeral and is not described in detail here.

The protrusive members **175***a* to **175***e* are protrusions extending from the first wall surface portion **100***a* into the liquid receiving chamber **180**. The protrusive member may have a rectangular parallelepiped shape (**175***a*, FIG. **17**A), a triangular prism shape (**175***b* to **175***e*, FIGS. **17**B to **17**E), or the like. In addition, the protrusive members **175***a*, **175***b* and **175***e* are disposed to contact both of the prism **170** and the first vertical wall portion **100***b***1**. By providing the protrusive members **175***a* to **175***e* as described above, it is possible to prevent the ink from being blocked by the prism **170** so that the ink at the first vertical wall portion **100***b***1** is guided to the liquid supply hole **110** (FIG. **4**A). Therefore, the ink in the liquid receiving chamber **180** (FIG. **4**A) may be efficiently consumed.

C-2. Second Modified Example

Even though the cartridge **10** has the prism **170**, **170***a* to **170***c* in order to detect a remaining amount of ink in the above embodiments (FIGS. **4**A and **16**A), the prisms may be excluded. In addition, instead of the prism used in the optical

method for detecting a remaining amount of ink, a sensor using a piezoelectric element or a sensor using an electrode may be adopted to detect a remaining amount of ink. Even in this configuration, the movement (misalignment) of the circuit board **130** with respect to the holder **20** may be suppressed, similar to the above embodiments, as the notch **140** of the cartridge **10** and the regulation pin **270** of the holder **20** cooperate. In addition, similar to the above embodiments, the manipulation for attaching or detaching the cartridge **10** to/from the holder **20** may be improved by means of the rotation point **166***w*, **216***w* or the deformation unit **212** of the holder **20**.

C-3. Third Modified Example

Even though the cartridge **10** uses the notch **140** as the first regulating unit in the above embodiments, the shape is not limited thereto. For example, a protrusion may be installed to the second wall surface portion **100***b* as the first regulating unit. In this case, a concave portion in which the protrusion is inserted instead of the regulation pin **270** is provided to the holder **20**. Even in this configuration, after mounting, the movement of the cartridge **10**, **10***a* in the width direction is controlled, and therefore the electric connection of the circuit board **130** and the printer **1** is maintained in a good state. In addition, even though the notch **140** is installed at the approximate center of the first vertical wall portion **100***b***1** in the width direction (FIG. **3**B), the invention is not limited thereto. For example, the notch **140** may be formed at a corner of the first vertical wall portion **100***b***1** in the width direction. In other words, even though both sides of the notch **140** of the above embodiments in the width direction are formed by the first vertical wall portion **100***b***1**, it is also possible that only one side is formed by the first vertical wall portion **100***b***1** so that the other side is opened. Even in this configuration, with respect to the mounted state, the movement of the cartridge **10** in the width direction (the movement in the width direction toward any one side thereof) may be regulated so that the misalignment of the circuit board **130** and the holder **20** may be suppressed. In addition, similar to the above embodiments, the manipulation for attaching or detaching the cartridge **10** to/from the holder **20** may be improved by the rotation point **166***w*, **216***w* or the deformation unit **212** of the holder **20**.

C-4. Fourth Modified Example

Even though the cartridge **10** is configured so that the second wall surface portion **100***b* has the first vertical wall portion **100***b***1**, the slanted wall portion **100***b***2** and the second vertical wall portion **100***b***3** in the above embodiments, the cartridge **10** may have any shape. For example, the cartridge **10** may have an approximately rectangular parallelepiped shape without the slanted wall portion **100***b***2**, or the second wall surface portion **100***b* may have a slanted shape as a whole. In addition, each wall surface portion **100***a* to **100***f* may be slanted at a certain angle, and an intersecting angle of the wall surface portions **100***a* to **100***f* may be other than 90 degrees. In other words, the ink cartridge **10** may have any shape if the liquid receiving chamber **180** for receiving an ink may be formed therein.

C-5. Fifth Modified Example

Even though the outer surface of the third wall surface portion **100***c* of the cartridge **10** has the rotation point **116***w* (FIG. **3**A) in the above embodiments, a protrusion may be provided to the third wall surface portion **100***c* so that the protrusion is set to the rotation point **166***w*. Even in this configuration, the cartridge **10** may be easily detached from the holder **20** by rotating the cartridge **10** centered around the rotation point **166***w*.

C-6. Sixth Modified Example

Even though the cartridge **10** has the protrusion unit **160** in the above embodiments, the protrusion unit may be excluded. In addition, the guide channel **200***t* or the hole portion **202** (FIGS. **7**A and **7**B) may also be excluded with respect to the holder **20** correspondingly. Even in this configuration, the manipulation for attaching or detaching the cartridge **10** to/from the holder **20** may be improved by the rotation point **166***w*, **216***w* or the deformation unit **212** of the holder **20**, similar to the above embodiments.

C-7. Seventh Modified Example

Even though the guide channel **200***t* of the holder **20** has the tapered lower guide channel **200***tu* in the above embodiments, the invention is not limited thereto. For example, the guide channel **200***t* may have an approximately uniform width. Even in this configuration, the protrusion unit **160** may be easily guided to the hole portion **202** of the holder **20** by the guide channel **200***t*.

C-8. Eighth Modified Example

Even though the terminals of the circuit board **130** are configured in two rows in the above embodiments, the terminals may also be configured in one row or in three or more rows. In addition, in a case where the terminals are configured in three or more rows, the first row closest to the first regulating unit (notch) **140** preferably include more terminals than the second row farthest from the first regulating unit (notch) **140**. By doing so, the electric connection between the printer **1** and each terminal included in the first and second rows may be maintained in a good state. In addition, in a case where the terminals are configured in three or more rows, more preferably the closer the row is to the first regulating unit (notch) **140** the more terminals are included. By doing so, the electric connection between the printer **1** and each terminal of the circuit board **130** may be maintained in a good state.

C-9. Ninth Modified Example

Even though the elastic portion (lever) **120** is provided to the second wall surface portion **100***b* of the cartridge **10** in the above embodiments, it is also possible that the container-side regulating unit **124** is formed at the second wall surface portion **100***b* of the cartridge **10** and also the engagement releasing unit **122** is provided to the holder **20**. Even in this configuration, the engagement of the holder **20** and the container-side regulating unit **124** may be released by applying an external force to the engagement releasing unit **122** by a user.

C-10. Tenth Modified Example

Even though the circuit board **130** (FIGS. **5**A and **5**B) having the storage unit **133** and the terminal group **130***t* composed of nine terminals **130***a* to **130***i* disposed at the surface is mounted to the container body **100** in the above embodiments, the terminal group **130***t* may be directly provided to the container body **100**. Even in this configuration, the movement (misalignment) of the terminal group **130***t* with

respect to the liquid ejecting device (the printer **1**) is suppressed so that the contact between the terminal group **130***t* and the liquid ejecting apparatus (the printer **1**) may be maintained in a good state. In this case, with respect to the length direction (the X-axis direction), the notch **140** is more preferably installed to the container body **100** to overlap with a part of the terminal group **130***t*. By doing so, the movement (misalignment) of the terminal group **130***t* to the liquid ejecting device (the printer **1**) may be further suppressed.

C-11. Eleventh Modified Example

Even though the examples of the cartridge **10**, **10***a* used for the printer **1** have been described as the liquid housing container in the embodiments and the modified examples, the invention may be applied to a liquid housing container capable of supplying a liquid to for example a device having a colored material ejecting head such as a liquid crystal display, a device having an electrode material (conductive paste) ejecting head used for forming an electrode of an organic EL display, a surface light-emitting display (FED) or the like, a device having a bio-organic material ejecting head used for producing a bio chip, a device having a test piece ejecting head as a precise pipette, and a liquid ejecting device such as a printing device or a micro dispenser without being limited thereto. In addition, without being limited to the ink cartridge, the invention may be applied to a holder to which various kinds of liquid housing containers may be detachably mounted. In order to use the liquid housing container for the various liquid ejecting devices, liquids (coloring agents, conductive paste, bio organic material, or the like) according to the kind of the liquid ejected by various liquid ejecting devices may be received in the liquid housing container. In addition, the invention may be applied even to various liquid ejecting devices equipped with a holder and a liquid ejecting system having a liquid housing container corresponding to various liquid ejecting devices.

What is claimed is:

1. A cartridge having a liquid receiving chamber configured to receive a liquid therein, the cartridge being configured to be mounted to a holder of a printer and to be detached from the holder by rotation, the holder having a hole portion, a regulating unit, a plurality of electric contact members, and a liquid supply tube covered with a filter, the cartridge comprising:

a first wall surface portion having a liquid supply hole configured to flow the liquid toward the liquid supply tube via the filter;

a second wall surface portion having a concave portion configured to be inserted into by the regulating unit;

a third wall surface portion opposite to the second wall surface portion and having a protrusion portion configured to insert into the hole portion, the liquid supply hole being located at a portion closer to the third wall surface portion than the second wall surface portion;

a fourth wall surface portion opposite to the first wall surface portion; and

a terminal group located at the second wall surface portion and configured to be electrically connected the plurality of electric contact members, the concave portion being located at a position closer to the first wall surface portion than the terminal group,

wherein, in a condition that a first direction is defined as a direction from the first wall surface portion toward the fourth wall surface portion, a second direction is defined as a direction from the third wall surface portion toward the second wall surface portion and is perpendicular to the first direction, and a third direction is defined as a direction perpendicular to the first and second directions,

the first wall surface portion is located, with respect to the liquid receiving chamber, at the first direction,

the second wall surface portion is located, with respect to the liquid receiving chamber, at the second direction,

the third wall surface portion is located, with respect to the liquid receiving chamber, at a direction that is oppose to the second direction,

the fourth wall surface portion is located, with respect to the liquid receiving chamber, at a direction that is opposite to the first direction,

the concave portion is opened to the first and second directions, and

the movement of the cartridge with respect to the holder in a direction parallel to the third direction is configured to be regulated when the concave portion is inserted into by the regulating unit in a state that the cartridge is mounted to the holder.

2. The cartridge according to claim **1**, wherein

the concave portion is configured to be inserted into by the regulating unit before the terminal group is electrically connected the plurality of electric contact members when the cartridge is mounted to the holder.

3. The cartridge according to claim **1**, wherein

a movement of the cartridge with respect to the holder in a direction that is oppose to the first direction is configured to be regulated after the protrusion portion inserts into the hole portion.

4. The cartridge according to claim **1**, wherein

a movement of the cartridge with respect to the holder in a direction that is oppose to the first direction is configured to be regulated after the protrusion portion inserts into the hole portion, and

the terminal group is configured to be electrically connected the plurality of electric contact members after the concave portion is inserted into by the regulating unit and the protrusion portion inserts into the hole portion.

5. The cartridge according to claim **4**, wherein

the terminal groups is located at a position partially overlapped with a position of the concave portion along a direction parallel to the second direction when viewing the cartridge from a direction that is oppose to the first direction.

6. The cartridge according to claim **5**, further comprising:

a foam disposed in the liquid supply hole and configured to be contacted by the filter.

7. The cartridge according to claim **1**, wherein

the terminal group includes a plurality of terminals,

each of the plurality of terminals has a contact portion,

a plurality of the contact portions of the terminal group are arranged in a first and second rows,

a number of the contact portions in the first row is less than a number of the contact portions in the second row, and

the second row is located at a position closer to the concave portion than a position at which the first row is located.

8. The cartridge according to claim **7**, wherein

the second row includes a contact portion of a grounding terminal among the plurality of terminals.

9. The cartridge according to claim **1**, wherein

the second wall surface portion has a vertical wall portion and a slanted wall portion,

the vertical wall portion stands from the first wall surface portion in a direction parallel to the first direction,

the slanted wall portion is slanted with respect to the vertical wall portion, and

one end of the second slanted wall portion is connected to the first vertical wall portion.

10. The cartridge according to claim **9**, wherein

the terminal group is located at the slanted wall portion.

11. The cartridge according to claim **10**, wherein

the concave portion is located at a center of the vertical wall portion in a direction parallel to the third direction.

12. The cartridge according to claim **1**, wherein

the second wall surface portion has a first vertical wall portion, a slanted wall portion, and a second vertical wall portion,

the first vertical wall portion stands from the first wall surface portion in a direction parallel to the first direction,

the slanted wall portion is slanted with respect to the first vertical wall portion,

a first end of the second slanted wall portion is connected to the first vertical wall portion,

a second end of the second slanted wall portion is connected to the second vertical wall portion, and

the second vertical wall portion stands from the second end of the second slanted wall portion in a direction parallel to the first direction.

13. The cartridge according to claim **12**, wherein

the terminal group is located at the slanted wall portion.

14. The cartridge according to claim **13**, wherein

the concave portion is located at a center of the first vertical wall portion in a direction parallel to the third direction.

15. The cartridge according to claim **1**, further comprising:

a fifth wall surface portion located, with respect to the liquid receiving chamber, at the third direction; and

a sixth wall surface portion opposite to the fifth wall surface portion.

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